THE

MECHANICS' MAGAZINE.

JANUARY 1ST—JUNE 30TH, 1855.

EDITED BY R. A. BROOMAN.

VOL. LXII.

"Ye have shivered mountains asunder, made the hard iron pliant to you as soft putty: the Forest-giants, Marsh-jötuns bear sheaves of golden grain; Ægir the Sea-demon himself stretches his back for a sleek highway to you, and on Firehorses and Windhorses ye career."—CARLYLE.

LONDON:
ROBERTSON, BROOMAN, AND CO.
Mechanics' Magazine Office,
166, FLEET-STREET.
AGENTS:—*EDINBURGH*, J. SUTHERLAND; *GLASGOW*, W. R. M'PHUN, AND DAVID ROBERTSON; *DUBLIN*, HODGES AND SMITH, 104, GRAFTON-STREET; *PARIS*, A. & W. GALIGNANI, RUE VIVIENNE; *HAMBURGH*, W. CAMPBELL.

1855.

INDEX

TO THE SIXTY-SECOND VOLUME.

Mechanics' Magazine.

No. 1639.] SATURDAY, JANUARY 6, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

HOWELL AND JAMIESON'S PATENT MACHINERY FOR MANUFACTURING SAWS.

Fig. 2.

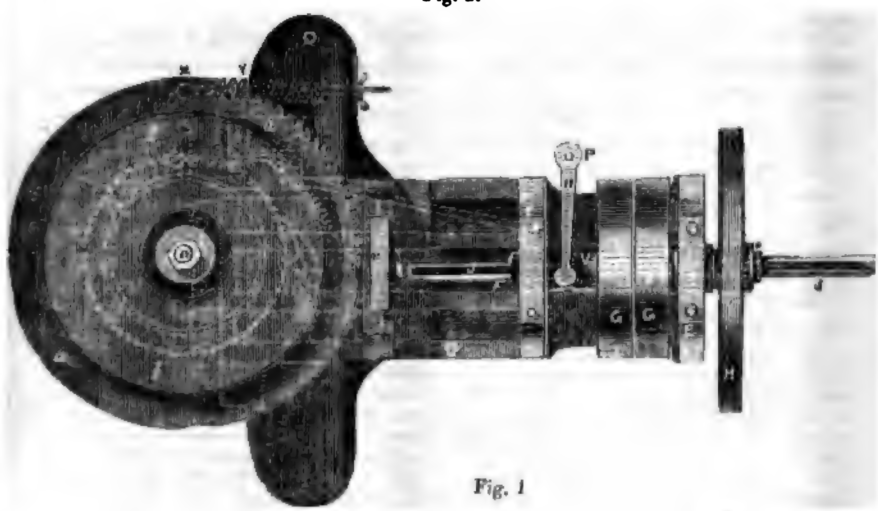
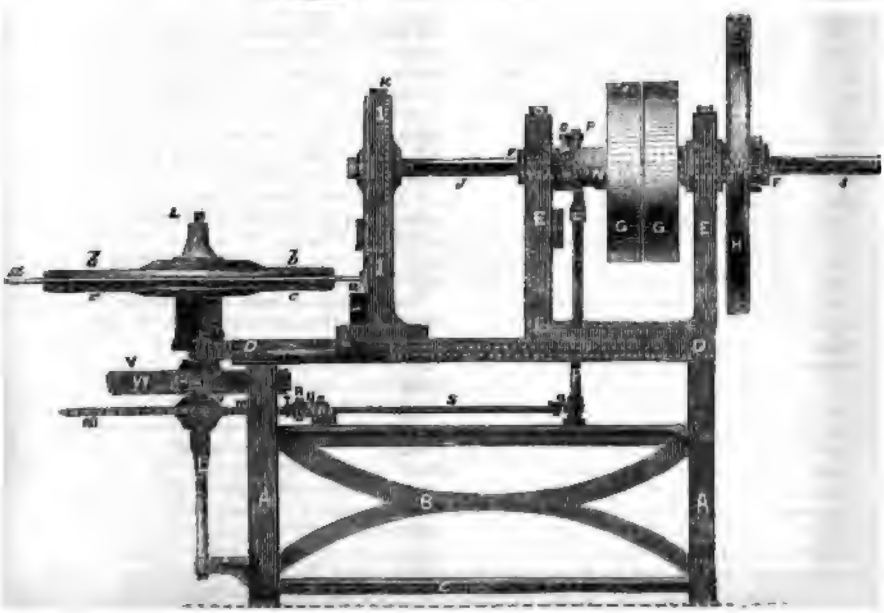


Fig. 1



HOWELL AND JAMIESON'S PATENT MACHINERY FOR MANUFACTURING SAWS.

(Patent dated July 25, 1853.)

MESSRS. J. B. HOWELL, of Sheffield, and W. Jamieson, of Ashton-under-Lyne, have patented a machine for improving the manufacture of saws, by means of which they are able, they state, to produce saws of every description with great facility and accuracy of workmanship.

One part of the machine consists of a punching-apparatus, the punch and its die being of such a form as to punch or cut out the notches or spaces by which the teeth of the saw are formed. It is combined or not, as may be required, with a shearing or cutting apparatus, the action of which is to give a correct straight or curvilinear form to the edge of the plate of metal on which the teeth are to be cut. Another part of the machine consists in the directing apparatus, by which fresh portions of the plate of metal are brought successively under the action of the punching and shearing apparatus. The punching and shearing apparatus is actuated by a cam or eccentric on a revolving shaft kept in motion by a steam engine or otherwise, whilst another cam on the same shaft gives motion to the directing apparatus; the operation of punching or cutting out the notches and moving forward fresh portions of the plate taking place alternately. A third part of the invention consists in the application of a rotatory file or files, by the action of which any roughnesses on the surface of the teeth of the saw are removed. They combine this part of their invention with the other parts, so as to form a single machine, or use it separately, as may be required.

Fig. 1 of the engravings on the preceding page represents a side elevation of a machine in which their improvements are exhibited as applied to the manufacture of circular saws; and fig. 3 is a plan of the upper part or table of the machine. A, A, &c., the two end frames or standards of the machine; B B a vertical cross rail for connecting the two standards together; C a bottom cross rail; D D, the platform or table of the machine, which is supported by the two standards, A, A, &c.; E E, a headstock, which carries the hollow axis, F F, on which are the fast and loose pulleys or riggers, G, G, on which the strap or band acts which gives motion to the machine; H is a fly-wheel at the outer end of the hollow axis, F, for regulating the motion of the machine, and is constructed so as occasionally to answer the purpose of a strap-pulley; I I is the punching headstock, which carries the mechanism for punching or cutting out the spaces or notches by which the teeth of the saw are formed, with which is also combined, when necessary, the cutting or shearing apparatus; J J, a shaft, having a longitudinal groove nearly the whole of its length. This shaft slides through the hollow axle, F F, and is carried round with it by means of a feather or pin which enters the longitudinal groove. By means of this contrivance, and a slot in the table or platform, D, the punching headstock, I I, can be placed in any position along the middle of the table (to suit the size of the circular saw to be manufactured), and clamped fast by means of a bolt passing through the slot. A cam or eccentric fixed on the shaft, J, actuates the slide, K, which has at its lower extremity a preparation to receive the punch and the shearing tool. These tools, when adjusted, are secured by means of set screws. Preparation is made on the frame of the headstock to receive the die corresponding to the punch, and the same with the shearing tool. The die and under shearing tool are adjusted and secured by means of set screws. L L is a vertical shaft or axis, at the upper end of which is fixed the plate of metal which is to form the circular saw. It carries the ratchet-wheel, M M, which must have as many teeth in it as there are to be in the circular saw to be made. It is moved forward one tooth at a time by the cam, N, on the hollow axis, F F. For this purpose the cam gives motion to the lever, O, on the vertical axis, P, which has at its lower end the arm, Q. This arm gives motion to the lever, R, by means of a connecting rod, S, the quantity of motion being regulated by means of an adjusting plate attached to the arm, Q. The lever, R, carries the click or catch, T, which takes into the teeth of the ratchet wheel, M, with which it is held in contact by means of a spring. U is another click or catch, which also takes into the teeth of the ratchet-wheel, M M, which it secures or retains each time the wheel is moved forward by the action of the cam, N. The catch, U, is held in contact with the ratchet-wheel by a spring, and turns on a centre secured to the cross rail, B. The ratchet-wheel, M M, and the mechanism connected with it, are chiefly shown by dotted lines in fig. 2. V V is a friction pulley

fixed on the vertical axis, L; this pulley is embraced by the friction brake, W, which is composed of two straps of metal connected together by two screw bolts, by means of which the friction of the brake on the pulley is regulated. One end of one of the straps is elongated so as to form an arm or lever, X, to the end of which is attached the spring, Y, at the opposite end of which spring is a tightening screw, which passes through a filbow attached to the underside of the platform, D. The quantity of the friction of the brake, W, and tension of the spring, Y, being regulated as described, the action is obviously to hold the ratchet-wheel, M, firmly against the catch, U, at the time when the cam, N, is drawing back the catch, T, in order to engage a fresh tooth of the ratchet-wheel. As the ratchet-wheel is moved forward the spring, Y, becomes lightened until its tension is sufficient to overcome the friction of the brake on the pulley, V; the brake then slips on the pulley, and the tension of the spring is diminished, until it is again tightened by the action of the cam, N, on the ratchet-wheel, M; *a*, the plate of metal which is to form the circular saw. It is firmly held betwixt the two plates, *b* and *c*, which revolve with the vertical axis, L. The punching headstock, I I, is fixed in such a position that the punch and shearing tool are enabled to act upon the edge of the plate, *a a*, which has been previously brought to somewhat near a circular form. The two cams are placed in such positions with respect to each other that when the first is forcing the punch through the plate of metal, the second, N, is in the act of drawing back the lever, R, to enable the catch, T, to take hold of or engage a

Fig. 3.

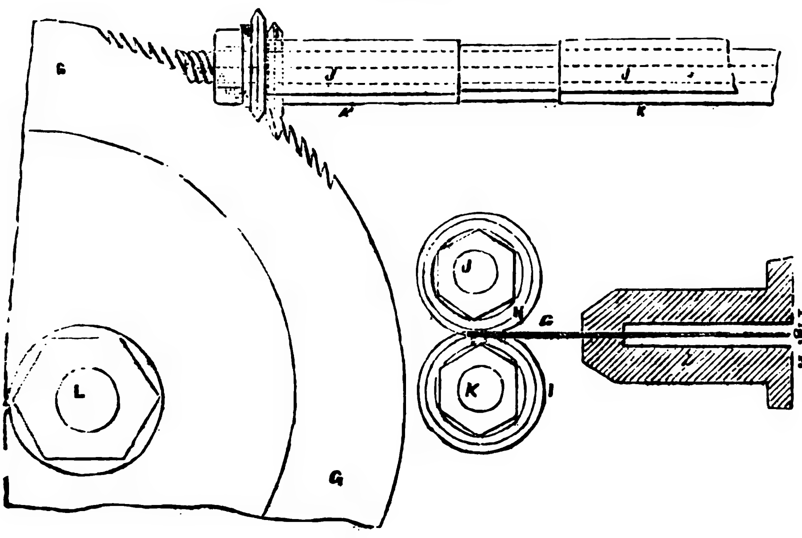


Fig. 4.

fresh tooth of the ratchet-wheel, M, and that when the first cam, by its reverse action has withdrawn the punch clear of the plate of metal, the second reacts on the catch, T, and consequently moves forward the ratchet-wheel one tooth. By this means a fresh portion of the plate, *a*, is brought within range of the action of the punch, and the process is repeated as before. This is continued until the teeth are formed all round; the saw being then complete is removed, and a fresh plate substituted in its place.

The inventors also describe a machine in which their improvements are exhibited as applied to the manufacture of reciprocating or straight-edged saws, the cutting edges of which have a straight or curvilinear form, and add the concluding portion of their invention, which consists in the application of a rotatory file or files for the purpose of removing the roughnesses and filing up the teeth of saws used in saw-gins for ginning cotton, and other saws which require to be treated in a similar manner. The construction and application of these files will be understood from figs. 3 and 4; fig. 3 representing a plan, and fig. 4 an end view of two rotatory files, as arranged and adjusted when in operation on the teeth of the saw; G G is a portion of a saw plate in which the teeth are partially cut (shown in

section in fig. 4); H a rotatory file which acts on the upper side of the saw plate; and L another rotatory file which acts on the lower side of the saw plate. The form of these rotatory files is similar to that of two frustrums of cones or solids of a conical form, the bases of which are placed together, forming an angular edge all round from which the bevil or slant surfaces slope both ways. On these slant surfaces the file teeth are cut all round, the form of the surfaces being such that while one of them removes the rough edge or arris from the back of one tooth, the other removes it from the front of the next. The action of the two rotatory files is simultaneous, the rough edges of the upper side of the teeth being removed by the upper file, and the rough edges of the lower side of the teeth being removed by the lower one. It will be seen that the two rotatory files cannot operate in the same space or notch between the saw teeth at the same time, but are placed so as to operate in notches a tooth or two distant one from the other. J is a shaft or axis on which the rotatory file, H, is fixed; and K a shaft or axis, on which the rotatory file, I, is fixed. These two shafts are geared together by means of toothed wheels, so as to operate both at the same time, and are fixed in a frame which turns on a centre or swivel. To this frame, and consequently to the rotatory files, a vibratory angular motion is given by means of a cam. When the files have removed the roughnesses from the edges of the teeth with which they are in contact, they are withdrawn clear of the saw by the action of this cam. The saw is then moved forward the space of one tooth by means of the directing apparatus, which being done, the rotatory files are each reinserted in fresh spaces or notches, and the operation is repeated as before, and this is continued until the roughnesses are removed from every tooth of the saw. When the rotatory files are combined with the machine shown in figs. 1 and 2, they are arranged so as to operate at the same time as the punching and shearing apparatus; when the punch and shearing tool are raised so as to clear the plate of metal, the rotatory files are withdrawn at the same time, so as to allow the plate to be moved forward the space of a tooth, as before described. In this case the rotatory files may be actuated by means of a strap or band from the fly-wheel; and as they are brought into action simultaneously with the punch and shearing tool, the same cam may be made to actuate both. But it is obvious that the rotatory files and their appurtenances may be arranged so as to constitute a separate machine, if required.

ON PERMANENT WAYS.*

A large and important question is that of Permanent Way. It involves the whole difference between railways and all other ways—highways, byeways, parish roads, and streetways. A railway is not a railway by virtue of its stations or signal-lights, or any other of the paraphernalia which strikes the eye of the public, but simply because of the long narrow bands of iron placed on the levelled surface, with more or less accuracy and substantiality. Take away these, and it is but a road of natural materials like most other roads; add these bands or rails—good and efficient rails,—good relatively to the work they have to do and the loads placed upon them—and the road of natural material thus banded with artificial, is in practical value, as compared with a horse-road, multiplied by ten. And when the steam locomotive is substituted for the horse, we may probably again multiply the efficiency of the means of conveyance by ten; so that the steam railway is, or should be, if rightly understood and employed, one hundred times as efficient as the horse highway.

But if the highway, and its natural material and horse-power, be the most perfect of its kind, and the railway, with its steam-power, be of very imperfect character, it may happen that the resistance encountered on the highway is actually less, in proportion, than that of the railway.

Supposing the levels to be the same, the railway is superior to the highway in the harder and smoother surface presented for the wheels to run on, providing that surface be non-deflecting, and that the joints of the rails be so formed as to make the rails practically a continuous bar. But if the joints occasion a series of jolts on the wheels,—if the rails deflect both vertically and laterally—if the sleepers work loose in insufficient ballast,—the railroad may become a far worse road for the locomotive than the highway is for the stage-coach.

Therefore, in determining what shall be the permanent way of a railway, the data for calculation must be—what are the maximum load, maximum speed, the resistance of the carriages or wagons, and the resist-

* "Practical Remarks on Railways and Permanent Way, as adapted to the various Requirements of Transit. By WILLIAM BRIDGES ADAMS, engineer. London: Effingham Wilson, Royal Exchange. 1854."
"The Permanent Way Company's Circular. October, 1854. London: Day and Son, Gate-street, Lincoln's-inn-fields."
"Railway Machinery. By DANIEL KINNEAR CLARK. Nos. 22, 23, and 24. Blackie, Edinburgh."

ance due to the gradients. In connection with these must be calculated the power and proportions of the locomotive, which must govern the structure of the line. The weight on the driving-wheels is one of the chief points to be considered, as to its damaging power on the rails. It is clear that if the weight be in excess, the rails may be deflected either laterally or vertically, or both; and if they do not deflect, they may be crushed and laminated, as we practically find to be the case. The earlier railways were constructed with very light rails. As the loads increased, the rails deflected, and the engines were overpowered, not by the actual loads, but in consequence of the deterioration of the way. It was assumed that the engines required increased power, when, in truth, they wanted *foothold;* therefore, larger engines were produced, and the destruction of the way greatly augmented.

The argument respecting light and heavy engines has been purposely made a vexed question; but it is plain enough to those who wish to understand it. We cannot better exhibit the truth of this statement than by giving the following extract from the work of Mr. Adams, whose successful inventions for the improvement of railways give importance to his judgment in the matter:

"This leads to the consideration of the quality of engines. By the terms 'light' and 'heavy' we must understand the relation that is borne to the rails and substructure on which the engines run. An engine may be light as regards one line, and heavy as regards another.

"And even supposing the heavy engines to possess more power than the light ones, it does not follow that they would draw a heavier train, because they lose power by having constantly to ascend deflections. Moreover, it must not be forgotten that the engine has to move its own dead weight, as well as the dead weight of the train, and the heavier the engine in proportion to its haulage power, the greater will be the disadvantage.

"But there is another consideration. Up to a certain weight, engines carrying their own water and fuel may be perfectly safe at any speed. Beyond that weight, the number of the wheels must be increased, and after that, a tender must be added, still increasing the number of wheels. And every increase of the number of the wheels, unless provision be made for free lateral traverse, to enable each pair of wheels to seek their path of minimum friction, will disproportionately increase the resistance of the machine on the rails. It would be possible that in certain positions, such as reversed curves, the engine might be arrested by the friction of its wheels on the rails.

"The real question is, how to attain the *maximum power* with the *minimum weight?* By power, we are to understand the surplus power remaining to draw a train, after supplying sufficient to overcome its own gravity and friction.

"Thus it may happen that a well-constructed light engine may be able to draw a heavier train than a heavy engine, by reason—

"1. Of having less dead weight.

"2. Of having less friction.

"3. By not crushing and deflecting the rails, and consequently running on a better road. For, by the terms 'light' and 'heavy,' are not to be understood '*small power*' and '*great power*,' for the small engine may have great power, and the large engine small power. A boiler formed of a given thickness of plate, 2 ft. 9 in. in diameter, will bear higher pressure than a boiler of 4 ft. in diameter, made of the same thickness of plate, and at the same time with less risk of bursting.

"But, it may be argued, there is a limit to the available power of an engine on four wheels, and trains are required imperatively of a weight and speed beyond that power, and it is better to *waste* power in accomplishing this object, than to use power without waste and not accomplish the business required.

"This would be quite true, supposing there could be no other means of accomplishing it. But the cheaper and simpler method is to run two light engines coupled together, instead of one heavy one, precisely as two, three, or four horses are attached to a carriage, instead of one. Thus, two engines with cylinders of 11 in. in diameter would move 500 tons along a level at 15 miles per hour; or 200 tons up gradients of 1 in 100 at 25 miles an hour; or 150 tons, on the level, at 40 miles an hour; the weight of each engine being about 15 tons, and being coupled by the fire-box ends, with a connection at the foot-plates, one driver and stoker might, if required, manage them. And two engines, so coupled, would be safer in case of a wheel breaking, than any ordinary six-wheel engine.

"It may be objected, that with two engines coupled together, there would be the same result as with two horses coupled together — a diminished amount of available power, for want of pulling uniformly.

"The answer to this is, that the two engines are to be so coupled as to constitute one, though permitting the two pairs of driving-wheels to work independently of each other, and without the mischievous friction which is the usual result of coupling two pairs of driving-wheels on the same engine,

"Long trains intended for distances, usually separate midway, and it is a saving of risk and loss of time to run them together, and it is economical not to have a heavy engine doing the work of a light one.

"With regard to consumption of fuel, supposing all engines to be constructed with equal accuracy, a given quantity per ton per mile will be burned, proportioned to the speed, the gradients, and the condition of the road. If, therefore, the heavy engine crushes the road, more coke will be consumed and *wasted*. And supposing no crushing, still every extra ton or every extra pound of resistance in the engine itself will represent so much extra coke.

"If, therefore, an engine weighing 15 tons can, by extra pressure, and reduced weight and friction, be made to draw as heavy a train as an engine of 30 tons, there will be a saving of coke equivalent to 15 tons, or three carriages, independent of the saving in friction and deflection, which may amount to as much more.

"Another consideration is, that the light engine may travel at far greater speed without damaging the rails or road, and though called light, the parts that are in motion are in reality proportionately stronger than the corresponding parts in heavy engines, while their less total weight reduces the amount of the momentum and risk.

"There is yet another consideration—*slip*. The real meaning of the term 'slip,' is 'deflecting rails.' If an engine on six wheels, with middle drivers, has much weight on the drivers, proportioned to the leaders and trailers, it will be apt to *pitch*. If it have little load on the drivers, the engine will be supported on either end, and the rails deflecting beneath the drivers, they will slip.

"The light engine, on four wheels, will not deflect the rails, and consequently the drivers will not slip. But supposing very light rails which do deflect, still the drivers will follow the rails, and produce adhesion.

"A strong argument in favour of light powerful engines, is their facility of great speed with little damage; they are less costly to clean, and may be more constantly at work; consequently, the journeys and returns may be made quicker, the public will be better pleased, and a smaller amount of rolling stock will be required.

"Of course, well-constructed trains should be used, corresponding to such engines, and in proportion to the diminution of dead weight, would be the diminution of momentum, and the constant diminution of risk, either of getting off the rails, or of doing damage in collision. And above all, the diminution of destruction to the road, which is the original cause of almost all mechanical accidents in the rolling portions of railway machinery."

We now have to offer some remarks suggested by the Circular of the Permanent Way Company. Regarding bad joints as one main difficulty in the permanent way—as an evil, in fact, precluding any permanence—Mr. Adams, as he states, some years back devised the "fish-joint," applicable to the double-headed rail. It is clear that this plan of uniting the rails was as true in principle when it proceeded from the inventor's brain as it is at the present day, after being extensively applied on many railways. Why, then, it should have been considered necessary to work this invention by a company, we cannot well understand. It was surely competent to railway companies and engineers to use it direct from the inventor as easily as from a Company, under the following directors and manager:—viz., *Directors:* P. W. Barlow, Esq., F.R.S.; W. H. Barlow, Esq., F.R.S.; Charles H. Wild, Esq.; James Samuel, Esq., F.R.A.S.; Robert Richardson, Esq.; Peter Ashcroft, Esq. *Manager*: Charles May, Esq., F.R.S. The reasons why the Company has been formed are thus stated:

"The development of traffic on railways, accompanied by the introduction of a heavier class of engines and increased speed, having rendered it necessary to improve the construction of the permanent way, so as to render it suitable for the heavier work it was required to sustain, several improvements were suggested by practical engineers, which became the subject of patents.

"The inventors or proprietors of such of these as were ascertained on experience to be sound and useful, considered that advantage would result from uniting their interests in these inventions: firstly, because it would enable companies to use two or more of the improvements combined, without having to deal with separate patentees; and, secondly, because it liberated them, as professional men, from the bias of interest in any particular patent.

"These views led to the establishment of the association known as 'The Permanent Way Company.'"

This is by no means satisfactory reasoning to us, and we suppose it is not satisfactory to the body of civil engineers—makers of railways—who opposed in Parliament the Bill by which the members of the Permanent Way Company sought to incorporate themselves, and place themselves in a position of greater power, analogous to that of the Electric Telegraph Companies.

If, indeed, the six directors and their manager had each invented and patented a seventh part of a specific permanent way,

we can understand that it might then be advantageous to combine all their inventions together; but if, on the other hand, the Company were got up for the purpose of buying up all patents of all kinds of permanent way, and of opposing by united efforts all newer inventions, or such as are not purchased by them, they would prove a very disadvantageous medium for the public and for inventors, compelling both to pay black mail; for it is tolerably clear that the inventor could afford to deal directly at a lower price than those who might buy from him, and seek to make a merchant's or monopolist's profits as a Company. The list of the present patentees is thus given in the Circular:

"W. B. Adams,; P. Ashcroft,; P. W. Barlow; W. H. Barlow; P. S. Bruff; John Gardner; L. D. B. Gordon; C. F. Guitard; J. W. Hoby; Sir John Macneill; Charles May; Robert Richardson; James Samuel; Charles H. Wild, &c., &c."

Although the name of Mr. W. B. Adams is at the head of the list, we understand that he has no connection with the Company, save that they use his patent; the employment of which he himself, we are informed, retains as a railway engineer.

(*To be continued.*)

ON THE FORMATION OF BRASS BY GALVANIC AGENCY.

Copper is more electro-negative than zinc, and separates more easily from its solutions than a metal less negative. If then, in order to obtain a deposit of brass by galvanic means, we employ a solution containing the two component metals, copper and zinc, in the proportions in which they would form brass, there will only be produced by the action of the battery a deposit of real copper; the zinc, more difficult of reduction, remains in solution. What must be done, then, to obtain a simultaneous precipitate of the two metals in the proportions required, is either to retard the precipitation of the copper, or to accelerate that of the zinc. This may be effected by forming the bath with a great excess of zinc and very little copper.

Dr. Heeren gives the following proportions as having perfectly succeeded:

There are to be taken of

Sulphate of Copper	1	part.
Warm water	4	,,
And then		
Sulphate of zinc	8	,,
Warm water	16	,,
Cyanide of potassium	18	,,
Warm water	36	,,

Each salt is dissolved in its prescribed quantity of water, and the solutions are then mixed; thereupon a precipitate is thrown down, which is either dissolved by agitation alone, or by the addition of a little cyanide of potassium; indeed, it does not much matter if the solution be a little troubled. After the addition of 250 parts of distilled water, it is subjected to the action of two Bunsen elements charged with concentrated nitric acid mixed with one-tenth of oil of vitriol. The bath is to be heated to ebullition, and is introduced into a glass with a foot, in which the two electrodes are plunged. The object to be covered is suspended from the positive pole, whilst a plate of brass is attached to the negative pole. The two metallic pieces may be placed very near.

The deposit is rapidly formed if the bath be very hot; after a few minutes there is produced a layer of brass, the thickness of which augments rapidly.

Deposits of brass have been obtained in this way on copper, zinc, brass, and Britannia metal; these metals were previously well pickled. Iron may, probably, also be coated in this way; but cast iron is but ill adapted for this operation. — *Mittheilungen des Hannov. Gewerbevereins,* through *Dublin Journal of Industrial Progress.*

PROGRESS OF PATENTS.

It is stated, on good authority, that the actual cash profits realized this year by the assignees of Ketchum's mowing machine, will not fall far short of *one hundred thousand dollars.* This may seem like a very large amount to those who have little knowledge of the value of patents or the progress of invention at the present day. But to us, such an announcement has no feature of surprise. We could name several other patents from which still larger sums are annually realized, while incomes of from 10,000 dollars to 50,000 dollars a-year from such sources are quite common.

Never in the history of this country or Europe has such a propitious time existed for inventors as the present. There is a growing demand for patents of all kinds, both at home and abroad. Rights which a few years ago were worthless, are now of precious value. The best of railroad stock is not to be compared, in monetary estimate and actual profit, to ownership in certain useful patents. In these hard times it is well to be acquainted with reliable sources of wealth and secure subjects of investment. The field of invention is open to all, whether learned or unlearned, rich or poor; but instead of being crowded with adventurers,

only a few individuals, comparatively, enter it. The chances of success for inventors are better now than ever, and we wonder that there is not a greater strife among them than there is, although the number of inventors have multiplied three-fold within the past five years.—*Scientific American.*

ON THE CONSTRUCTION OF BOILERS.

To the Editor of the Mechanics' Magazine.

SIR,—The steam engine is one of the greatest and grandest achievements of mechanical science; and since the improvements made by Watt, all our energy and mechanical appliances have been turned to it, in order to arrive, as near as possible, to perfection in its construction. In this course it has assumed various forms and modifications suitable to the exact position and purposes for which power is to be used. The boiler, on the contrary, which may be justly termed the source and producer of power and motion, bearing the same relationship to the engine that the heart does to our body (if I may be allowed the comparison), has till very recently been almost neglected. This may have partly arisen from the cause above mentioned, as also from the great abundance of good fuel which exists in this country, not requiring it to be so economically used. Our attention has now, however, been especially called by repeated disastrous occurrences, to examine the state of its construction and strength (or, rather, the want of both), when high pressure is used. It is to be regretted that engineers or boiler-makers have been so backward in bringing to notice the various experiences and difficulties encountered in the course of their profession, from which some data could be deduced, and which would have tended to the advancement of mechanical science and knowledge upon this interesting subject, considering the importance of which, I trust the following remarks will not be deemed entirely out of place, as they are made to point out some of the most palpable or erroneous ideas adopted, while all abstruse reasoning, not suitable to the mind of a thoroughly practical man, will be avoided. There are several principles and conditions that require great attention in the construction and form of a good and efficient boiler; amongst others, I may mention the following:

1st. The best or most suitable form to sustain the required pressure.

2nd. The most correct mode of structure for the above purpose, which will depend, in some measure, upon the quality of the material used.

3rd. A sufficient area for steam, and the necessary water space.

4th. A proper proportion between the fire grate and flue or tube areas.

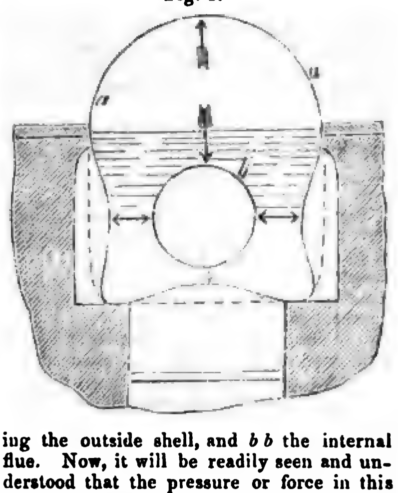
5th. The length of the tubes should bear a relative proportion to their diameter.

6th. A boiler (when possible) should be so constructed in form as not to require stays, &c., to remedy its defects; but only as an additional means of safety.

And I would add, as an appendage, that much depends upon the caution exercised in their working.

Having thus stated a few of the particulars that should exist in all boilers, whether for high pressure, or otherwise, I will now proceed to consider how far the construction now in use will agree with or conform to the same. It is generally understood that the waggon-shape boiler was about the first used for engines of moderate power and low pressure. This form is represented by fig. 1, which shows a transverse section, *a a* being the outside shell, and *b b* the internal flue.

Fig. 1.

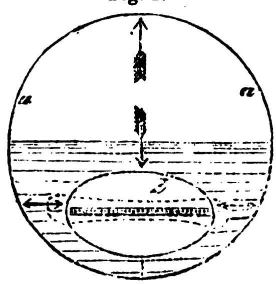


Now, it will be readily seen and understood that the pressure or force in this instance is applied internally upon the shell, *a a*, and externally upon the flue, *b b*, the direction of the force being illustrated by the arrows; it will, therefore, require little argument with those possessing the slightest knowledge upon the subject, to prove that we have in this boiler three curves in its form, totally at variance with the principle of strength, and which render the correct form of the crown or top of no avail. Any excess of pressure would have a continual tendency to force the sides and bottom to assume a shape somewhat similar to that exhibited by the dotted lines. With the

flue which is correct in form, it would be entirely different, as we know that the resisting power of cylindrical bodies to compression would be directly as their diameters. For instance, a flue 2 feet in diameter, of such form, would resist double the pressure of one 4 feet in diameter, of a similar form; and the pressure being equal on each square inch of its circumference, would prevent any very great variation in profile or shape, should the material be of the required strength or thickness. There is yet another defect in the construction of the above mentioned boiler, arising from the flat ends being at right angles to the sides or bottom; the pressure or force upon these would, of course, be in the ratio of the area of the surface. The flue, *b b*, often forms the only stay or support between the ends, and is used also as a means of fixing other stays to the crown and bottom, which are in many cases rendered useless, from the want of principles in their introduction or direction. Yet this boiler has been used at pressure varying from 5 lbs. to 12 lbs. on the square inch of its surface. The only claim that can be advanced in its favour at all, is the free and extensive water surface and steam-room; but the form is false and dangerous for great as also for low pressures, the only query being how it has been retained in use so long.

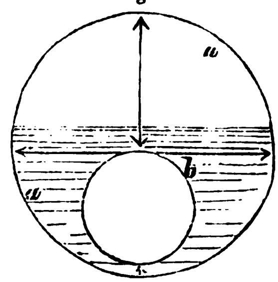
The cylindrical boiler having an elliptical flue, illustrated by fig. 2, is the next I will

Fig. 2.



take under consideration. The shell is at *a a*, and *b b* is the internal flue, extending from one end to the other of the boiler. The pressure upon the shell in this instance has a form best adapted to resist it, the tension being along with the strength, in the ratio to its diameter; but in the flue it is not so, as it will be perceived by the direction of the arrows, showing the compressing force, that the crown of the flue bears the greatest pressure, the ends being also acted upon in such a manner as to be incapable of affording the necessary support to resist the same, and the pressure therefore has a tendency continually to force the flue into the collapsed form exhibited by the dotted lines in the diagram. The fire bars are generally placed in a longitudinal direction with the flue; and although there may be sufficient width of grate, there is yet not a sufficient height between the surface of the bars and the crown of the flue, for the mixture of the gases arising from combustion, and the cold air introduced for the prevention of smoke, of which more will be said hereafter. The cylindrical shell has also been used in connection with a cylindrical internal flue, as shown by fig. 3, which is a transverse section

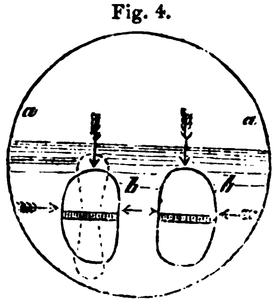
Fig. 3.



of a boiler so constructed, the direction of the force being as before in that of the arrows. In form, this is all that could be desired, when the ends are made spherical; but they are more generally used with the ends flat, which renders it, according to the above principle, defective; in either case it is difficult to obtain what is now thought a sufficient amount of heating surface, but it is yet retained in use to some considerable extent.

I may also point out another form of flue, or flues, that is used in a cylindrical shell (see fig. 4), a patent for which was granted

Fig. 4.

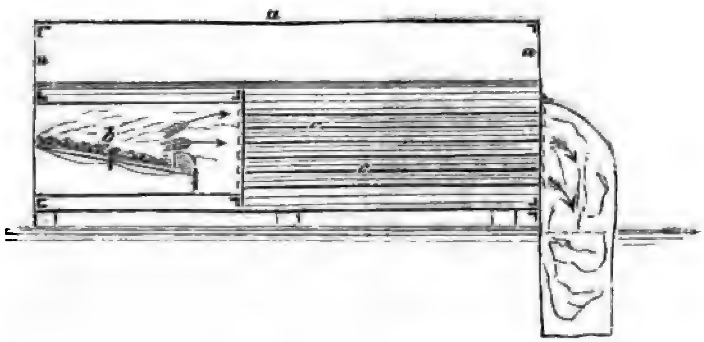


some few years ago, to an engineer who is now allowed to be one of the greatest authorities upon this subject. In this case the force of compression is exhibited by the arrows. I have no occasion to point out the defect in this form, as it will be seen, from the excess of pressure upon the flat sides, *b b*, as com-

pared with the crown, that it is one of the most dangerous forms that could be adopted. I am aware that the same has been extensively tried in marine boilers, but in this case there is a limit as to width in such constructions; besides which, they are chiefly low pressure, but in the former case it has, I believe, to be used as a high-pressure boiler, and also when the above conditions need not be so strictly observed. It would absorb too much of your space, and occupy too much of the reader's time, to follow out in due order all the various forms and constructions that have been advanced from time to time, as improvements, some of them differing so slightly from those above mentioned as to merit no particular notice. Our subject will, therefore, bring us to consider the most recent improvements tried, and in many cases adopted; and as that class, generally termed multitubular, has received the attention due to it by engineers, I will just venture to add a few considerations on the advantages and defects as existing in some examples.

I have stated before, as an axiom, that a proper proportion should exist between the fire grate and flue area (or tube area), and also that the length of the tubes should bear a relative proportion to their diameters; we will, therefore, see how far the present examples agree with this condition. Fig. 5

Fig. 5.



represents, in illustration, a section of a boiler upon the tubular principle; the shell being shown at *a a*, and the furnaces at *b b* (in this case there are two); the tubes are also shown at *c c*; it will be perceived that the combustive products, after leaving the grate, pass through the tubes, *c c*, direct into the chimney; but I may mention that in some examples it is caused to return, through a second or upper tier of tubes over the furnace, and repass into the chimney. But to return to the above points, I will give as an illustration the proportion of a boiler under my own observation, having two tiers of tubes, and consequently a great excess of tube area, in proportion to the fire grate; the length of tubes being about 13 feet 6 inches, and the diameter about 2¼ inches. The action of this boiler, having such a great length of tube compared to the diameter, is not at all satisfactory, either as regards fuel or the supply of steam, and it is found to be impossible to keep the tubes from being choked up with the accumulation of *soot*, for more than four hours' working. On inspection, the cause is easily discernible, namely, the small sectional area, in proportion to the great length of the tube, which is shown to have a *tendency to extinguish the flame* before it reaches the end of the same; and that there can be no adequate supply of steam, arises from the small amount of heat in the tubes being drawn through rapidly, too rapidly, to produce any effect; in proof of which I will give the following simple illustration. Suppose a metallic plate is passed rapidly through a flame proceeding from any ordinary fire, what amount of heat would be communicated to the same? None! But, suppose again that we allow the plate to dwell over the flame for a length of time, what effect then should we have? The heat of the flame would, of course, be given off to it. Now, in this illustration the heat is at right angles to the plate, but acting directly upon it. In the case of the boiler above mentioned, the heat in the tubes also acts at right angles to it, but it is drawn through so rapidly, as to give it no time to produce the desired result; whereas, were the tubes shorter the draught would not be so strong, and the heat would be given off to the tubes in a greater degree than it is now.

I will only just produce another case, and that is a boiler, the area of the fire-grate in which is the same (or nearly so) as that mentioned above; but it has only one tier of tubes, the length of which being

6 feet 6 inches, and the diameter about 3 inches. The power of this boiler is also about the same as the above, but the result obtained is very superior. Here we have plenty of steam, economy of fuel, and good working; the draught is not too quick nor too slow, and the tubes are kept clear for two or three months, and the dead plate at the end is not so much heated; evidently showing that the heat has been given off to the tubes on its passage through, and the flame often extends the whole length. This will be proof sufficient that we gain little either in the economy of fuel, or the amount of efficient heat, by making the tubes long and of small diameter. I will not now venture to draw attention to the variety of opinions that exist, as to the difficulty there is in maintaining a proper circulation of the water in contact with the tubes in these boilers, nor yet to the free escape of the steam, but just proceed to consider how far the best example above mentioned will agree with our settled ideas as to the prevention of smoke. I have said that it contains two furnaces, for the purpose of being enabled to fire alternately; there is also a large mixing chamber behind the bridge, or before the holes. Concerning the alternate firing, it no doubt produces good results when strictly adhered to, but until we can make the stoker into a mere machine, and get him to work as such, we cannot depend upon great results from this source only, and considering the class we have to contend with, it is almost hopeless. There is another error we are liable to fall into, and that is placing the fire bars too near the crown of the furnace, thereby leaving no room for the due admixture of the gases arising from the combustion, and the cold air admitted either through the interstices of the bars, or through perforations to the chamber behind the bridge; upon which subject I cannot do better than refer the reader to the copious Treatise published by Mr. C. W. Williams, in which he will find the whole clearly and ably defined. There is yet another point worthy of notice, and that is the manner in which the fuel is placed upon the bars; the prevailing custom is to build upon the mass behind the door, or in front of the fire grate. It should be laid evenly over such surface, from front to back, when the air will have no difficulty to pass, and mix as before stated.

In the foregoing remarks, I do not suppose the same rules would be exactly favourable in locomotive boilers, in which all are well aware a different kind of fuel is used, but there are points in which the same may be justly applied.

In conclusion, I cannot help repeating what I have before stated, that it is to be regretted, for the advancement of science, that engineers and men well versant with mechanical arts should not come forward and give their testimony towards arriving at just and correct conclusions on their various experiences, which would furnish us with good and correct data.

I am, Sir, yours, &c.,

ENGINEER.

Manchester, Nov. 30, 1854.

ON ORDNANCE AND GUNPOWDER.

To the Editor of the Mechanics' Magazine.

SIR,—It is remarkable that, although upwards of half a century has elapsed since the publication of Robins' work on practical gunnery, so small an amount of additional knowledge of the properties of gunpowder should have been acquired, and so great a diversity of opinion should still exist relative to its effects as a propellant power. Some advocate his opinion that, in a loaded gun, the whole of the charge of powder is ignited before the ball is sensibly moved from its place,—an opinion upon which he has based his theory; whilst others maintain that the explosion is gradual, and imagine that velocity is gained by slow ignition of the powder, and build certain hypotheses thereon as to whether the powder should be coarser or not to suit the size of the piece of ordnance or gun. Although the superiority of the gunpowder of the present day is, no doubt, great compared with that with which Robins made his important experiments, the nature of it is precisely the same, and a few of his simple experiments will show the latter opinion to be erroneous. One author speaks of an accelerative propellant force being required—which nobody will deny—but argues that it may be obtained by the systematic arrangement of the granulation of powder; it seems, however, that the material fact that powder loses its effect as a propellant power proportionately as the space in which it is confined is enlarged, is lost sight of by those who advocate such a system. An accelerative propellant power would, doubtless, be a first-rate acquisition; but I cannot comprehend how it may be obtained by gunpowder or any explosive material (except by firing off several charges in succession before the ball has time to leave the gun, were such a thing possible), not only on account of the reason before stated, but that the heat generated would not be so great in the explosion of a smaller quantity at a time, and consequently the velocity of expansion would be less.

Setting aside for the present the question as to whether a charge of powder is exploded

instantaneously or gradually; let us consider whether it would be beneficial to have a gradually-exploding powder or not. Let us suppose, for instance, that one-third of the charge, or a quantity, the expansion of which would cause the ball to be moved from its place, should become ignited before the remainder, the explosion of that remainder would take place in the space caused by the movement of the ball from its place between the ball and the ignited portion of the charge of powder. So that should the ball, by the explosion of that portion, be moved four times the length of its diameter up the barrel, the explosion of the rest would take place in a space of about six times the size of that in which it was at first confined, and lose its propelling power in proportion.

It is impossible to get more than a certain quantity of power out of a given charge of powder, and the more instantaneous the explosion, the greater the effect produced, the greatest portion of its force depending upon the intensity of the heat generated by the explosion. Now still arguing on the supposition that the ball may be moved before the whole charge of powder is ignited, let us take two charges, one coarser grained than the other, in order to burn more gradually; and suppose the one to explode instantaneously, the other not to have entirely exploded until the ball is two-thirds out of the barrel. When the ball had reached that distance, the amount of power behind it (considering gunpowder as a permanent elastic fluid) would be the same in both charges, with this difference in the effect, that the charge of powder which exploded at once will have imparted a greater velocity to the ball from the whole force of the charge having acted upon it from the beginning; and though, owing to that superior velocity, the air before it being more condensed, would offer an increased resistance, that would be more than counteracted by its decreased resistance to the explosive fluid behind it. Therefore, allowing that powder which would explode gradually would bring the same power to bear on the ball (which is far from the case), the advantages would still be in favour of that which explodes instantly; but it will be found that both charges would have exploded before the ball would be moved, if the powder be equal in quality. It is unaccountable that a fact so easily proved by experiment should be doubted by any one. The very argument used occasionally by those who advocate the theory of powder gradually burning (and in favour of its good effect) goes against it; namely, that a ball cannot instantly attain an extreme velocity, and that it requires to be gradually set in motion. Now, the flame of gunpowder, it is well known, moves with a rapidity of expansion of 7,000 feet in a second, and with a heat greater than red-hot iron; therefore for any of the powder to escape ignition, unless the ball were previously propelled from its place with an initial velocity of *over* 7,000 feet a second, would be impossible. It has been said that the quickness of gunpowder destroys its propellant force, being soon burnt out; if so, it entirely puts aside the hitherto received fact, that it is converted by ignition into a permanently elastic fluid, and in that case, whether quickly or slowly exploded, the same quantity of equally good powder would produce the same proportion of fluid, the propellant power of which would only be affected in proportion to the space in which it might be confined when ignited.

Gunpowder itself has been improved, and brought to great perfection; but there appears to have been little knowledge acquired as to its properties, or how to use it to the best advantage. The improvements in small arms have not been kept pace with as regards cannon; and, consequently, for the latter still to be of service in the field, it is absolutely necessary that some attempt be made to increase their range. A cannon is loaded much in the same way it was two hundred and fifty years ago. The great power to be contended against in all projectiles is simply the atmosphere; the only advantage that has as yet been gained is by offering less opposition to its force, by having balls (of rifles only, except Lancaster's guns, which is still an experiment) of a conical form. Robins was the first to discover the great resistance met with from the atmosphere by projectiles, and its effects on them, especially before leaving the gun, as also when confined between the ball and the powder; but little ever seems to have been attempted to defeat the one or profit by the other. Every sportsman, or person who has interested himself on the subject, is aware, that if a space be left between the powder and ball, the gun, unless of extraordinary strength, will burst or swell out; and the experiment having been made with a sufficiently strong piece, the ball was found to have attained a much greater velocity, the gunpowder being confined to as small a space as possible when ignited, not otherwise. Robins accounted for it in this manner, that the flame not being confined by a heavy body, which it is obliged to impel before it dilates itself with a velocity much beyond what it can at any time impart to a ball by its continued pressure conveniently, if the ball be placed at a distance from the powder, the powder will have acquired a considerable degree of this expansion, and the first motion of the ball will not be pro-

duced by the continued pressure of the powder, but by the actual percussion of the flame, and it will begin therefore to move with a quantity of motion proportionate to the quantity of the flame and the velocity of its respective parts. "A moderate charge of powder," he also says, "when it has expanded itself through the vacant space and reaches the ball, will, by the velocity each part has acquired, accumulate itself behind the ball, and be condensed thereby prodigiously; whence, if the barrel be not of extraordinary firmness in that part, it must, by the reinforced elasticity of the powder, infallibly burst." Now here is a power which no one had as yet attempted to control and turn safely to account, to the best of my belief, until I lately made some experiments on it myself. After repeated trials, I ascertained that by introducing a portion of air in a certain manner between the powder and the ball, the additional velocity obtained was very great, and without the least strain on the gun. I shall be glad to send you an exact account of the manner in which it is done, for the benefit of any of your readers that may take an interest in such matters; but being the subject of a patent, I cannot do so just at present. The great advantage such a manner of loading a gun possesses is, that, independently of the powder not being bruised or crushed in loading, it has, though confined previous to its explosion, room to expand with a certain velocity before it acts upon the ball. Whether Robins is correct or not in his opinion that the additional velocity is acquired in the manner he states, I cannot undertake to say; but I imagine that the action of the heat and expansion of the fluid on the air confined between the powder and the ball must have more to do with it than he seems to consider. I should be glad of the opinions of any of your readers on the subject.

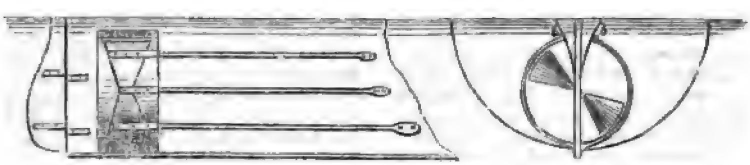
I am, Sir, yours, &c., T.

DE PENNING'S CYLINDRICAL GUARD, OR SCREW-PROTECTOR.

(Patent dated May 31, 1854.)

To the Editor of the Mechanics' Magazine.

SIR,—The recent enormous loss sustained by the country in the wreck of the *Prince*, laden as she was with a most costly cargo, is sufficient to direct the attention of engineers and others to the causes of the catastrophe, with a view to the prevention of the recurrence of so calamitous a circumstance. Every one knows (for every one is now a newspaper reader) that the *Prince* was lost in consequence of her propeller having become disabled by fouling with the dismantled spars and rigging. And, to me, it is a matter of no surprise that such fouling took place, under the circumstances. For, in addition to the fact that the screw-propeller is situated in the after-deadwood, and so occupies a very convenient position for such a mishap, it is clear that its



rotatory action is eminently calculated to carry down, and draw towards the *débris* of a wreck that may be on or near to the surface of the water, floating by.

Foreseeing the danger arising from this circumstance, and having heard of similar accidents resulting from the screw coming in contact with floating matter, I some time since directed my attention to the subject, and have succeeded in effecting an arrangement which, if applied, is, in my judgment, calculated to most considerably reduce, if not to altogether do away with, the possibility of danger from such a cause for the future.

The accompanying engravings show a longitudinal view and thwartship section of the after part of a vessel fitted with the cylindrical guard. From them it will be seen that I place a metallic cylinder around the path traversed by the outside of the blades of the propeller, and attach it, by means of flanges, to the vessel. This shield serves

the double purpose of confining the action of the screw to the water within the cylinder, thereby increasing the propelling effect, and of guarding the propeller, to a great extent, from coming in contact with floating materials as above suggested. The cylinder is further supported by three stays, as shown, which may be placed parallel to the keel in cases where the form of the ship is such that they would not require to be too long when thus fitted, or they may be carried into the ship's side, and formed of thin metal, so that, presenting themselves edgeways, they will offer but little resistance to the progress of the vessel. It is true that *débris* might float in a fore and aft direction, and foul the propeller, but the probability of this would be but small, and might be still more diminished by increasing the number of stays, which, acting as guards, would effectually fend off all foreign substances and wrecks; while the cylinder would even permit them, were they attached to the cordage, to lay alongside without hindering the movements of the screw, and when without it, we should to a certainty have a deplorable result.

I think, Sir, your readers will see, that if fitted with a guard of this description, a vessel would be greatly secured from accidents of the distressing character that I alluded to in the opening paragraph of my letter.

I am, Sir, yours, &c.,
G. A. De Penning.

Charing-cross.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

Sir,—I had intended paying my respects to your correspondent, Mr. Woodcock, with the view of showing that he has, in his last letter, completely extinguished all efforts to uphold the doctrine of "smoke burning;" at least, he has shown its advocates to be so utterly unworthy of credit, that a short time alone will be necessary to put the theory and the theorists out of the pale of forbearance. I must, however, let my remarks give place to the following letter, from Mr. Fairbairn, of Manchester; the more so as it is so much in point to the present state of the discussion.

Here, Sir, we have the letter of a sound thinking, practical man; showing that he has clearly appreciated the true principles of combustion, founded, as they are, on the undeviating laws of nature, and which we cannot abrogate with impunity. Now, it is only necessary to compare this letter with the inflated mass of mystification which *runs through every* line of the communications of Mr. Woodcock and Mr. Mansfield, to see where truth lies, and credit should be given.

I am, Sir, yours, &c.,
Chas. W. Williams.

Liverpool, Dec. 30, 1854.

MR. FAIRBAIRN TO MR. C. W. WILLIAMS.

My dear Sir,—In wishing you better health and many returns of the season, I have much reason to apologize for the time that has elapsed since I received your two letters. Nevertheless, I have been alive to the whole of your correspondence in the *Mechanics' Magazine*, and my surprise is that you should have the patience to notice and reply to the quackery that is at present afloat on the subject of the smoke nuisance. You have already, in your excellent work, nearly exhausted the subject; and the chemistry of the question is there *made so clear and apparent*, that little further remains to be said. From the first, I had no difficulty in appreciating the value of your investigations, which, in my opinion, established the true principle of combustion, and clearly showed in what manner and to what extent the combination of the gases with the oxygen of the air was to be effected.

On the first appearance of your work (first edition), I took those quantities or equivalents as fixed and determined laws, which we could not abrogate with impunity; and in all my researches on this question, I applied myself more to the means, either in construction or mechanical proportion, to effect, with greater facility and greater certainty, the combinations therein recommended, as essential to perfect combustion, with the absence of smoke.

At the present moment, every man having a boiler, or having the least claim to being an engineer, is his own doctor; and hence follow the endless nostrums that are constantly brought before the public, for the attainment of an object which, in my opinion, may easily be accomplished, by attention to a few simple rules, founded upon those undeviating laws of nature which have been propounded for our use.

I make no doubt, we shall ultimately accomplish the object so long under discussion, and all these schemes, patents, and projects which are now in circulation may eventually lead to good results. I am glad to find you have time to look after them, and to cut up the plagiarist, copyist, and pretender for their unscrupulous conduct.

Mr. Holdsworth, myself, and others are establishing an association here, and in surrounding districts, to prevent boiler explosions. We have got about 250 firms, representing upwards of 1,000 boilers, and

we propose, exclusive of inspection, giving instructions on the construction, management, and economy of fuel, and ultimately the abatement of the smoke nuisance.

Now, I know of none so able to assist us in carrying out these objects as Mr. C. W. Williams; and I hope you will not only allow us to calculate upon your co-operation, but any suggestions you may have to offer will, in the mean time, be gladly received and acknowledged.

I am, Sir, yours, &c.,
W. Fairbairn.

Manchester, Dec. 26, 1854.

To the Editor of the Mechanics' Magazine.

Sir,—Mr. Mansfield's letter in your last number calls for a reply. He complains that in a quotation from his now celebrated letter, I omitted certain words. The sentence quoted is as follows—the words omitted being those in italics—viz.: "The lamp-black carbon floats in the current of carbonic acid and steam, mixed with the nitrogen of the air, *and with the unburnt residual tar vapours of greater density*. Such is the atmosphere which leaves the fire-place soon after coaling, and passes....&c." These words were omitted intentionally, to save the trouble of repeating, that where the air is properly introduced and mixed with the gas, *no "residual tar vapours" can possibly exist*. Mr. Woodcock has proved this by the use of my *perforated air* diffusion plate, in his late patented re-invention.

Mr. Mansfield asks, why I omitted these words? He will permit me to ask him, why he introduced them? He has thrust in these tar vapours, while they exist only in his imagination. To show that Mr. Mansfield is right in saying that the products are "carbonic acid and steam and the nitrogen of the air," I will supply him with an authority even better than his own. Let him turn to page 236 of my Treatise (last edition), and he will find Professor Brande, in answer to my queries on the very point of, What is smoke? says—"Your system of throwing jets of air into the inflammable gases *and vapours* which constitute so large a part of the matters, which in many ill-constructed fire-places, escape by the chimney, along with the finely-divided carbon, or black smoke, *renders them all available as sources of heat*; and where that system is perfectly applied, the smoke can consist of very little else than *carbonic acid, steam, and nitrogen*; all *incombustible*, and also incapable of supporting combustion." Does Mr. Mansfield require any further authority?

And now for the gem of Mr. Mansfield's lucubrations. "If any of our readers," he observes, "still believes that smoke cannot be burned, that is to say, for practical purposes, consumed, he may satisfy himself by the following child's experiment. Let the bowl of a clay tobacco pipe be filled with coal powder, luted over with clay, and put into the fire in a common hearth. Let the nearest child, or adult" (the word adult ought to have been omitted,) "of either sex, be asked what the fumes are, which will soon be seen issuing from the tube-end of the pipe? He, she, *or it* will answer—'Smoke.' Let a lighted candle then be applied to it. I tried the experiment when I was in the nursery." Now it is recorded that this very experiment was made by Murdock to convince Watt that coal gas might be available for the purpose of illumination. Mr. Mansfield's child no doubt would have shown both these philosophers that they were wrong, and that it was smoke, and not gas, that was emitted. But I will force Mr. Mansfield to the point. Let him say, if these fumes are "smoke," *what, then, is gas?* To this question I demand a reply. If he declines, his silence will prove to me either that he is at length coming to the sense of manhood, or that he has learned but little since he was an occupant of the nursery.

I am, Sir, yours, &c.,
C. W. Williams.

Liverpool, Jan. 1, 1855.

To the Editor of the Mechanics' Magazine.

Sir,—Having noticed the discussion on Mr. Woodcock's furnace in your pages, I take the liberty of referring any of your readers who may be curious on the subject, to the specification of the patent of James Gilbertson, 15th January, 1828, published in the *Repertory of Patent Inventions*, vol. vii. (3rd series), page 65. They will there find a very complete account of Mr. Woodcock's mode of heating the air by passages at the sides of the fire communicating with a perforated bridge. This invention is, therefore, open to the public, who may freely use it if it should really be found to possess any advantage over the old methods of admitting cold air at the bridge. The perforations in Gilbertson's furnace are in the form of parallel slits, and he describes the perforated plate as "the air grating at the top of the air cavity, to prevent the fuel from falling into the air cavity, and *to diffuse the heated air freely among the smoke of the fire*."

This patent, taken in 1828, does not leave much to be claimed either by Mr. Woodcock or Mr. Williams. Perhaps Mr. Williams will object to the word *smoke* in the specification; but Gilbertson appears to have been content to use a word which

would be understood by every one, and not to have thought it necessary to substitute for it such terms as gas, hydrocarbon, cumole, or rigmarole. A man who should ask his servant for a vessel of truncated conical form, closed at the bottom, and constructed of silicate of potash and oxide of lead, and filled with protoxide of hydrogen in the liquid state at a temperature of 50° Fahrenheit thermometer, might show his learning, but would be more likely to remain thirsty than if he were content to ask for a glass of cold water.

I am, Sir, yours, &c.,
C.

Dec. 30, 1854.

COAL-TAR.—BENZINE.

To the Editor of the Mechanics' Magazine.

SIR,—The question between Mr. Calvert and myself, as to Benzine—Benzole, shall, as he suggests, be decided by a court of law.

I am, Sir, yours, &c.,
CHARLES B. MANSFIELD.

Weybridge, Jan. 2, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

ERARD, JEAN BAPTISTE NUMA, of Paris, France, gentleman. *Improvements in the preparation of paint.* Patent dated June 9, 1854. (No. 1271.)

The inventor says, "I mix about 2¼ lbs. of a composition which I call caustic, and which is made of 460 grs. troy of virgin wax, 75 grs. of dry white soap, 150 grs. of salt of tartar, and about four glasses of water, with about 150 grs. of rosin, 150 grs. of gum lac, 150 grs. of gum arabic, 150 grs. of gum galipot, 75 grs. of gum copal, and 150 grs. of borax." The mixture thus obtained he combines with oils by means of heat.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in machinery for cutting brads, lath nails, and others of similar character.* (A communication.) Patent dated June 9, 1854. (No. 1273.)

A complete description of this invention formed the first article of our last Number.

BRAMWELL, THOMAS, of Enfield-house, near Gateshead-on-Tyne, Durham. *Improvements in the manufacture of the carbonates and prussiates of potash and soda.* Patent dated June 9, 1854. (No. 1274.)

Claims.—1. The use of sulphate of potash or sulphide of potassium instead of pot or pearlash of commerce in the manufacture of prussiate of potash, or of sulphate of soda, or sulphide of sodium, instead of soda, or carbonate of soda, in the making of prussiate of soda. 2. The separation of carbonate of soda from a mixed solution of carbonate of potash and soda by means of salting out the carbonate of soda by boiling. 3. The separation of sulphur from solutions of potash, or soda salts containing sulphides, by means of black oxide or of finely divided iron, whether the said potash or soda salts be used in the making of prussiates, or for the manufacture of carbonates, or other form of potash, or soda alkalies.

NELSON, JOHN, of Selby, York, and DAVID BOYD, of the same place, flax-scutchers. *Improvements in preparing and scutching flax, hemp, and other substances.* Patent dated June 9, 1854. (No. 1275.)

In carrying out this invention, the flax, hemp, or other substance is conducted by an endless apron to a succession of pairs of grooved rollers, through or between which the fibrous substances pass and become crushed, and the fibres partly separated, and then pass to another endless apron, by which they are conducted to a pair of fluted rollers, the axis of which are in suitable frames, and these fluted rollers become the holder of the fibres when subjecting them to the scutching process, &c.

HANCOCK, JAMES LAMB, of Neath, Glamorgan, medical practitioner. An improvement in cutting hay, straw, and other fibrous articles and substances. Patent dated June 9, 1854. (No. 1276.)

Claim.—Combining the parts of a machine for cutting hay, straw, and other fibrous articles and substances in such manner, that the trough or apparatus containing the matters to be cut shall be in an oblique direction to that of the cut of the cutting apparatus of the machine.

CURRIE, JAMES, of Glasgow, Lanark, North Britain, miller, and ROBERT YOUNG, of the same place, engineer. *Improvements in the treatment and grinding of grain and the products thereof.* Patent dated June 9, 1854. (No. 1277.)

This invention consists primarily in washing grain, by means of a revolving shaft working within a perforated cylinder or half-cylinder, and furnished with screw or inclined blades, the shaft being set in a tank, which the washing-water is made to flow through in a direction contrary to the course of the grain, and to carry off the floating refuse, the heavy foreign matters falling to the bottom.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in stitching and sewing machines, and in machines for securing and ornamenting parts of garments and other materials.* Patent dated June 9, 1854. (No. 1279.)

This invention relates to a novel arrangement for taking up the "slack," to another for insuring a perfect stitch, to discontinuing the travelling action of the material at pleasure, and to a method of causing the needle of machines for making button holes and parts connected with it to travel, while the material is held stationary.

BRAITHWAITE, JOHN, of Gower-street, Middlesex, civil engineer. *An improved method of roofing or covering buildings, reservoirs, and other spaces requiring roofs or coverings.* Patent dated June 10, 1854. (No. 1281.)

This invention consists in constructing suspension roofs or coverings, supported on suitable end-piers or abutments.

DAWSON, ARTHUR LLEWELLYN, of Southwark-bridge-road, Surrey, engineer. *Improvement in machinery for cutting or shaping wood.* Patent dated June 10, 1854. (No. 1282.)

This invention consists in certain arrangements of machinery, whereby gun-stocks, &c., may be cut and shaped from a pattern. We shall probably give an illustrated description of it hereafter.

YOUNG, JOHN, of Wolverhampton, Stafford, manufacturer. *Improvements in locks and latches.* Patent dated June 12, 1854. (No. 1288.)

Claims. — 1. Making the edges of the tumblers of locks serrated for the purpose of preventing the picking of locks by forcing back the bolt. 2. Constructing locks in which one of the tumblers has a rising while the others have a falling motion, &c., &c.

PÉTER, ANTOINE LOUIS, of Lyons, France. *Improvements in treating a certain kind of indigo.* Patent dated June 13, 1854. (No. 1291.)

This invention consists in extracting from Manilla or Philippine Island indigo calcareous and earthy matters, by means of acids or acid solutions, which, combining with the said impurities, give rise to soluble salts.

PICKUP, JAMES, of Liverpool, Lancaster, engineer. *Improvements in steering apparatus.* Patent dated June 14, 1854. (No. 1295.)

This invention consists in the peculiar employment of a screw to communicate the requisite motion to rudders in steering vessels, the principal object being the reduction of the entire apparatus to a smaller compass and more convenient form.

HARGRAVE, JOHN, of Kirkstall, York, worsted manufacturer. *Improved machinery for washing, scouring, and felting, or fulling.* Patent dated June 14, 1854. (No. 1296.)

Claim.—An arrangement of machinery whereby the material to be operated upon may be subjected to the action of beaters on its passage through the vessel containing the washing or scouring liquor.

WILSON, THOMAS, of Birmingham, Warwick, engineer, and JOHN HADLEY, of Birmingham, engineer. *A new or improved method of constructing certain kinds of rolls or cylinders, and dies or surfaces.* Patent dated June 15, 1854. (No. 1299.)

Claim.—Making ornamental rolls, or cylinders, and dies, or surfaces of steel to be used for ornamenting metallic surfaces, &c., by forming the same in portions, and combining them together.

KITE, JAMES, of Princes-street, Lambeth, Surrey, engineer. *Improvements in machinery and apparatus for expressing moisture from substances.* Patent dated June 15, 1854. (No. 1300.)

Claim.—The expression of moisture from substances by means of one or more cylindrical, or similarly shaped vessels, provided with pressing or straining apparatus, and the delivery of such substances so treated by part of the apparatus employed in expressing the moisture.

STIRLING, JOHN DAVIE MORRIES, of Blackgrange, Clackmannan, Scotland. *Improvements in the manufacture of iron.* (Partly a communication from M. Leon Talabot.) Patent dated June 15, 1854. (No. 1303.)

This invention consists in causing the beds of refinery, boiling, and puddling furnaces to be covered with oxides of iron or of some other metal, or of some of the earthy bases mixed with saw-dust, or other ligneous, resinous, tarry, or oily, and such like matters, and in running molten iron thereon; also, in "introducing such matters into such furnaces, and there mixing them with the melted iron, and running the melted iron thereon, and in using a mixture of oxide of iron (or compounds of oxides) and cinder (puddling or boiling furnace cinder being preferred) in a state of fusion, and adding thereto a quantity of cast iron in a fluid state, and as soon as the ebullition (consequent upon such addition, and upon the chemical action which results) is finished or nearly so, introducing a piece of wrought iron, to which the newly formed resulting wrought iron will attach itself, and to which it is to be gradually pressed by any convenient instrument."

PIPER, JOHN EDWIN, of New-road, St. Pancras, Middlesex, operative chemist. *Improvements in the preparation of linen, cotton, and other fabrics, to produce fictitious leather.* Patent dated June 16, 1854. (No. 1304.)

Claim.—The preparing linen, cotton, or other fabrics, with flour, paste, and a com-

position of white lead and boiled linseed oil mixed with any suitable colouring matter so as to produce a fictitious leather.

HORNSBY, RICHARD, of Spittlegate Iron-works, Grantham, Lincoln. *Improvements in portable thrashing machines.* Patent dated June 16, 1854. (No. 1306.)

This invention consists in suspending the ends of the shakers nearest the thrashing parts of the machine in links, and giving a rising and falling motion to the back ends of the shakers by means of a crank-axle or otherwise, so that the principal action is towards the back end of the shakers; and also in applying moveable riddles or screens at the back end of a thrashing machine beyond the dressing machinery in such manner that the pulse and matters blown from the dressing machinery may be driven against a perforated surface, which admits of the passage of air through it, but not of the pulse, which falls on a riddle below.

FELL, THOMAS MARA, of King William-street, London, and WILLIAM COOK, of Cuzon-street, Hanover-square, Middlesex. *Improvements in ventilators.* Patent dated June 16, 1854. (No. 1307.)

This invention consists in "the construction of ventilators having plates of perforated or gauzed material fixed to a rule joint or frame, or other contrivance, whereby the said plates are made to open or shut at an angle, with or without connection with the moveable portion of the sash or frame."

HARGROVE, CHARLES, of Birmingham, Warwick, manufacturer. *An improvement or improvements in the manufacture of certain kinds of iron.* Patent dated June 16, 1854. (No. 1309.)

Claim.—"Manufacturing malleable iron, or cast iron, capable of being annealed or rendered malleable by adding wrought iron to the ordinary malleable iron, either during or after the smelting of the same."

JULYAN, FREDERICK JOHN, of Gerrard-street, Soho-square, Middlesex, carpenter. *Improved methods of producing musical sounds.* Patent dated June 16, 1854. (No. 1313.)

This invention consists in passing a current of air over or across a portion of a stretched string, or a membrane so placed as by its vibrations alternately to obstruct and clear the aperture through which the air passes.

PIDDUCK, WILLIAM GILBERT, of Camberwell, Surrey, gentleman. *Improvements in the construction of vent-pegs.* Patent dated June 16, 1854. (No. 1314.)

The inventor forms in the vent-peg an air passage, extending upwards from the bottom of the peg (or that part which is inserted into the barrel) to an opening in the side, the passage being governed by a pressure-valve, so constructed and applied, that when acted upon, to admit air into, or shut it off from the barrel, it will have no tendency to draw up the liquor, and get clogged.

PARRAMORE, THOMAS, of Castle-street, Southwark. *An improvement in the manufacture of air-tight seats, beds, and other articles required to be inflated and air-tight.* Patent dated June 16, 1854. (No. 1316.)

This invention consists in rendering woven fabrics water-tight on one of their surfaces by applying oil thereto, and water and air-tight on the other surface by means of India rubber.

LOWE, DAVID, of Leicester. *Improvements in knitting machinery.* Patent dated June 16, 1854. (No. 1317.)

This invention consists in constructing machinery so that the thread carriers, in place of laying the threads on the needles as heretofore, lay them on instruments which correspond in number with the spaces between the needles, and which are caused to lay and sink the threads on and between the needles, and allow of other instruments coming in (whilst the preceding ones retire) and working the course on the needles.

HINDE, GEORGE JAMES, of Wolverhampton, Stafford, commercial clerk. *A new or improved combination of materials to be used for the manufacture of pipes or tubes for drains, or such other purposes as the same is or may be applicable to.* Patent dated June 17, 1854. (No. 1318.)

This invention consists in "the application of enamel to articles made of clay, or mixtures composed mainly of clay."

FONTAINMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in treating bitumen.* (A communication.) Patent dated June 17, 1854. (No. 1319.)

Claim.—Converting hard bitumen into soft bitumen by means of oil of petroleum, or pyroligneous oil, or a mixture of both.

FOURDRINIER, JOSEPH, of Sherbourne-street, Islington, Middlesex. *Improvements in machinery for washing, boiling, cleaning, and bleaching, rags, fibrous and textile substances.* Patent dated June 17, 1854. (No. 1321.)

This invention consists in constructing a vessel closed at each end and mounted on hollow axles. On the interior, near each end, is fixed a sieve of fine wire cloth or other suitable material. The vessel is provided with manholes for charging and discharging the materials, and to the two hollow axles of the vessel a pipe with branches is connected, by which water or washing or dyeing liquids can be caused to flow in one end, and away at the other. In the interior of the vessel are a number of spheres which, by the rotation of the vessel, cause

the matters under process to be beaten and pressed. Steam pipes or a steam jacket, or both, are used for causing the fluids to boil.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in machinery for block-printing.* (A communication.) Patent dated June 17, 1854. (No. 1322.)

This invention consists in a mode of arranging on flat surfaces consecutive portions of so much of a design as is intended to be reproduced in one colour, and giving rotary motion thereto; and in arranging in one machine a series of blocks or flat printing surfaces containing component parts of the same design, so as to print the latter in various colours upon a fabric.

RAWE, JOHN, the younger, of Haverstock-hill, Middlesex, gentleman. *Improvements applicable to stoves, stove-grates, or fire-places for domestic use.* Patent dated June 17, 1854. (No. 1323.)

This invention mainly consists in the application to stoves, stove-grates, or fire-places for domestic use, for the purpose of feeding the same, of an apparatus or mechanical arrangement of the nature of a force-pump constructed to remove a small portion of coal at a time from a reservoir provided for the purpose, and force it into the lower part of the fire.

HOLLOWAY, GEORGE, of the firm of Holloway, Brothers, of Stroud, Gloucester, clothes manufacturer. *Improvements in sewing and embroidering machines.* Patent dated June 17, 1854. (No. 1324.)

Claims.—1. A mode of passing the thread as it leaves the bobbin over or around a wire twisted to the form of a spring, and attached to the frame of the machine. 2. The employment of springs for keeping the bowles of the rocking levers, which work the needles, in continuous contact with the working faces of their respective cams. 3. Certain described means of effecting the lateral adjustment of the cam by which the rocking lever of the circular needle is worked.

WILLIAMS, JOHN ALLIN, of Baydon, Wilts, farmer. *Improvements in machinery or apparatus for ploughing and cultivating land.* Patent dated June 17, 1854. (No. 1325.)

Claims.—1. A mode of arranging or disposing one or more ploughs, or other cultivating instruments, in one frame, each separate instrument being capable of adjustment at the will of the ploughman, or attendant, by means of lever handles and front pulleys, and chains connected to beams or bars. 2. A mode of forming the lever beams or bars for holding the ploughs, skim cultivators, and drags, with an eye or joint, as described. 3. The peculiar arrangement and position of a hind running wheel, which is made to run always in the furrow last formed by the set of ploughs, though situated at or near the centre of the framework.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

SKERTCHLY, JOSEPH, junior, of Kingsland, Middlesex, and Ansty, Leicester, engineer. *Improvements in the manufacture of gates, hurdles, and fencing, in vehicles, wagons, carts, and trucks, for common roads and railways, and in facias, entablatures, window-headings, parapets, and other mouldings projecting from the brickwork of buildings.* Application dated June 8, 1854. (No. 1267.)

This invention consists in facing or covering the surfaces of wooden mouldings with sheet iron or other metal, by the process of drawing, or by mechanical pressure.

JOURNET, PIERRE, of Rue de Belsunce, Paris. *Improvements in chucks for lathes.* Application dated June 8, 1854. (No. 1268.)

This invention consists in arranging lathe-chucks in such manner that the article to be fixed in the lathe is held between sliders placed in a circle, equidistant from one another, and which slide to and from the centre.

MARGUERITTE, FRÉDÉRIC, of Paris France. *Improvements in wet gas-meters.* Application dated June 9, 1854. (No. 1272.)

The inventor places above the cisterns used for gas-meters a reservoir, communicating with the cistern by means of a pipe descending into it, for the purpose of preserving the required level of the water in it.

COOK, BENJAMIN, of Birmingham, Warwick, manufacturer. *Certain improved means of ornamenting metallic bedsteads, chairs, and couches, which said improvement is also applicable for ornamenting standards for glass frames, tables, and fire-screens, cornice-poles, and other articles of furniture.* Application dated June 9, 1854. (No. 1278.)

This invention consists in passing over the iron or brass bars or tubes of which the parts of the articles above mentioned may be composed, glass or china tubes, which may be moulded in any desired form and in any number of parts.

BUCHHOLZ, GUSTAV ADOLPH, of Hammersmith, Middlesex, civil engineer. *Improved machinery applicable to the hulling or cleaning of grain, seeds, and other vegetable produce.* Application dated June 9, 1854. (No. 1280.)

This invention consists of improvements

upon the machinery patented by M. Buchholz, December 24, 1853.

BARCLAY, ANDREW, and JOHN BARCLAY, both of Kilmarnock, Ayr, engineers. *Improvements in printing textile fabrics and other surfaces.* Application dated June 9, 1854. (No. 1283.)

This invention relates principally to certain improvements upon the printing machinery for which patents were obtained by Mr. James Melville, of Roebank-works, in 1852 and 1853.

BOIS, LOUIS, stockholder, of Paris, France. *Certain improvements in looms.* Application dated June 10, 1854. (No. 1284.)

These improvements consist in a system of thread-carrying needles, by which the weft is crossed through the shed, another set of needles holding the weft thus shot for the purpose of forming a selvage or fringed border.

ALEXANDER EDWIN POWLEY, of Lincoln's-Inn-fields, mechanical draughtsman. *Improvements in moulding.* (A communication.) Application dated June 10, 1854. (No. 1286.)

This invention consists in a mode of forming moulds for casting toothed-wheels without patterns. The circular portions of the wheels, such as the rims and bosses, are formed by a rotating arm with a scraper attached, and the spokes by suitably shaped scrapers, and the teeth by inserting small pieces of clay made hollow for the rim, such pieces or cores corresponding with the spaces between the teeth, and being put into their places by the aid of an apparatus similar to a dividing engine.

PULS, FRANCIS, of Whitechapel-road, Middlesex, philosophical instrument maker. *Improvements in electro-galvanic apparatus for medical purposes, parts of which improvements are also applicable to other electro-galvanic apparatus.* Application dated June 10, 1854. (No. 1287.)

The main feature of this invention consists in employing at the place of interruption, instead of points, flat or rounded plates, "which," says the inventor, "prove less liable to oxidation by the electric spark, and cause it to spread further. This arrangement also produces a more agreeable sensation than when the electricity springs from a point to a plate, or the reverse, at the place of interruption."

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *A method of producing plans in relievo.* (A communication.) Application dated June 12, 1854. (No. 1289.)

This invention consists in producing plans in relief by blowing air in between two sheets of caoutchouc, (parts of which are covered with silk or other similar material), and then hermetically closing the edges of the sheets.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *An improvement in, or addition to, sugar-basins.* (A communication.) Application dated June 12, 1854. (No. 1290.)

This invention consists in so forming and combining two vessels that they register the quantity of sugar placed in or taken from them.

COMPTON, CHARLES HENRY, of Bloomsbury, Middlesex, gentleman. *An improved railway-break.* Application dated June 13, 1854. (No. 1292.)

This invention consists of a self-acting break for railway carriages, operated by the pressure of the buffers against each other, and by the drawing-rods.

SOUTHALL, WILLIAM, of Swan-lane, London, gentleman. *Improvements in revolving cutters.* Application dated June 13, 1854. (No. 1293.)

The main feature of this invention consists in "the application and use of revolving cutters of any kind, such cutters revolving in a direction at right angles with the movement of the machine."

BARLOW, JAMES, of Accrington, Lancaster, machinist. *Improvements in the mode or method of extracting gluten, and preparing the same for sizing purposes.* Application dated June 14, 1854. (No. 1294.)

The inventor takes flour, and makes it into dough or thick paste, and puts it into a barrel having a number of fine longitudinal slots, and fixes this barrel on suitable bearings, placing a perforated tube or pipe through it, into which he injects water, so that as the barrel revolves, the water acts upon the dough, and separates the gluten and starch, leaving the former in the barrel, and carrying the latter off with it through the slots.

EDWARDS, JOSEPH, of Camberwell, Surrey, gentleman. *An improved knife-cleaner.* Application dated June 15, 1854. (No. 1297.)

Within an oblong narrow box, standing on its narrow edge, the inventor places a wooden cylinder of about 9 inches diameter and 8½ inches wide, covered with leather, fixed upon a spindle, and operated by a small winch; and round this cylinder is an endless leather band passing over a small roller, which, by means of a screw, can be made to cause more or less friction of the band on the main cylinder, as required, the band being pressed by a friction-roller.

MARTINI, FREDERIC, of Elberfeld, Prussia, and Mumford-court, Milk-street, London. *An improvement in steam engines.* Application dated June 15, 1854. (No. 1298.)

This invention consists in surrounding the cylinders of steam engines with mantles, and filling the space between the cylinder and the mantle with steam of a considerably higher pressure and temperature than that used in the working cylinder.

GEDGE, JOHN, of Wellington-street, South, Middlesex. *Improvements in the construction of locks and latches, spindles and knobs, applicable to doors and other similar purposes.* Application dated June 15, 1854. (No. 1301.)

The inventor proposes to use a spindle, the under part of which is flat, and is fitted with two springs, either formed in the solid spindle, or affixed to the surface of it, so that the handle or knob slips over them and is retained by them, the springs being pressed back when it is required to take the handle off, by means of an awl or wire pushed through a hole in the handle.

VARLEY, SAMUEL, of Stamford, Lincoln, engineer. *An improved construction of hay-making machines.* Application dated June 15, 1854. (No. 1302.)

The inventor so constructs a hay-making machine that the tines in their rotation, as they pass over the hay field, meet with an obstruction that might cause them to break, fold back, and by thus yielding escape without injury.

BRINDLEY, WILLIAM, of Moorgate-street, London, machinist. *Improvements in applying steam for offensive and defensive purposes.* Application dated June 16, 1854. (No. 1305.)

This invention relates to modes of applying steam, particularly high-pressure steam, by means of metal and flexible tubing, to purposes of attack and defence.

COOKE, WILLIAM, of Curzon-street, Hanover-square, Middlesex. *Improvements to boots and shoes.* Application dated June 16, 1854. (No. 1308.)

The inventor proposes to attach portions of a second sole to such parts of boot or shoe soles as are liable to wear.

EVANS, WILLIAM, of St. Leonard's-terrace, Chelsea, Middlesex. *An improved tap for drawing off liquids.* Application dated June 16, 1854. (No. 1310.)

This invention consists in constructing taps or cocks, so that when they are driven into a cask or barrel, in the act of tapping it, the liquid shall be prevented from escaping.

MARTINI, FREDERIC, of Elberfeld, Prussia, and Mumford-court, Milk-street, London. *A new and improved construction of steam engines.* Application dated June 16, 1854. (No. 1311.)

The inventor's engine is formed of two moveable diaphragms, hermetically closed round their outer parts, the steam being made to enter between them, producing a short but powerful motion which can be increased by leverage.

MACNEE, JAMES, junior, of Glasgow, Lanark, merchant. *Improvements in caps, hats, and other coverings for the head.* Application dated June 16, 1854. (No. 1312.)

This invention essentially consists in forming an inner framing separate from the outer covering of caps, hats, &c., in such manner that whilst it constitutes a stiff frame when set up, it can be rolled up or folded into an exceedingly small space.

HUGHES, HESKETH, of Aldersgate-street, London, engineer. *Certain improved machinery for cutting and embossing, either separately or simultaneously.* Application dated June 16, 1854. (No. 1315.)

This invention consists of a modification of Mr. Hughes's invention patented August 13, 1853, and described on page 208 of vol. lx.

ASPINALL, JOHN, of Tavistock-square, Middlesex, civil engineer. *An improved means of creating a vacuum, or partial vacuum, for evaporative purposes.* Application dated June 17, 1854. (No. 1320.)

This invention consists in creating a vacuum, or partial vacuum, in sugar and other like pans, by means of steam introduced through a blast-pipe.

*** The documents of No. 1285 are with the law-officers, under objection.

PROVISIONAL PROTECTIONS.

Dated August 26, 1854.

1875. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in obtaining motive power. A communication.

Dated October 19, 1854.

2236. Samuel Mason, shoe manufacturer, and William Beeby, clicker, both of Northampton. Certain improvements in the manufacture of coverings for the human leg and foot.

Dated December 13, 1854.

2615. Jos Mayer, of Dale Hall Pottery, Longport, Stafford, manufacturer, and John David Kind, of Birmingham, Warwick, manufacturer. An improvement or improvements in door-knobs or handles, made of china, earthenware, glass, or other vitreous or semi-vitreous substance, and in attaching the said knobs or handles to their spindles.

2616. Charles Frederick Stansbury, of Cornhill, London. A machine for cutting keys. A communication.

2618. Auguste Edouard Laradoux Bellford, of Castle-street, London. Improvements in sewing-machines. A communication.

2619. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved inkstand. A communication.

2620. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in photography. A communication.

2621. John Louis Jullion, of Combe-house, Tovil, Kent, analytical chemist. Separating certain vegetable fibres from mixed fabrics for various useful purposes.

2622. Charles William Grant, of Bath, Somerset, a lieutenant-colonel on the retired list of the Indian army. Certain apparatus for the production of draught, and prevention of smoke in domestic stoves and fire-places.

2623. Hiram Berdan, of New York. Compressible life-boat.

2624. Samuel Fisher, of Birmingham, Warwick, engineer. Certain improvements in ordnance and in machinery and apparatus to be employed in manufacturing the same.

2625. Christopher James Taylor, of Handsworth, Stafford, agent. Improvements in protecting underground telegraph wires.

2626. Thomas Finnemore Evans, of Philpot-lane, London. Improvements in the manufacture of candles. A communication.

2627. Thomas Haimes, of Melbourne, near Derby. Improvements in warp machinery.

2628. William Crees Taylor, of Catherine-grove, Greenwich. Improvements in constructing the bearing parts of shafts and axles.

2629. John Court, junior, of Sheerness, Kent, builder. Improvements in rockets.

Dated December 14, 1854.

2630. James Redgate, of Sneinton, Nottingham, lace manufacturer, James Thornton, of Nottingham, mechanic, and Edwin Ellis, of Sneinton, Nottingham, lace manufacturer. Improvements in machinery for the manufacture of lace and other fabrics.

2631. Richard Ruston, of Lansdown-villa, Northumberland-street, Vauxhall-road, Birmingham. Improvements in anchors.

2632. Llewellyn William Evans and James McBryde, of Saint Helen's, Lancaster, manufacturing chemists. Certain improvements in the burning of sulphuret ores for making sulphuric acid and for smelting.

2633. William Frederick Padwick, of Hayling Island, Hants, gentleman. An improvement in projectiles.

2635. William Charles Scott, of Warner-road, Camberwell, Surrey, gentleman. Improvements in paddle-wheels.

2636. Peter Edwin Henderson, of Trafalgar-square, Charing-cross, Middlesex, civil engineer. Improvements in ventilating ships.

2637. Louis Cornides, of Trafalgar-square, Charing-cross, Middlesex. Certain improved apparatus for coating or covering surfaces of glass or other material with collodion.

2638. James Rose, of Ashford station, South Eastern Railway, Kent. An improvement in constructing the fire-boxes of steam boilers.

Dated December 15, 1854.

2639. John Rowley, of Camberwell, Surrey. Improvements in machinery or apparatus for embossing natural and artificial leather, and woollen, cotton, paper, silk, and other woven or felted fibrous materials, the said improvements being more particularly adapted to those machines in which heat is employed for effecting such said embossing.

2640. William Clark, of Upper-terrace, Islington, Middlesex, engineer. Improvements in anchors.

2641. Uriah Scott, of Duke-street, Adelphi, Middlesex, engineer. An improved method of constructing hollow and solid metallic bodies.

2642. Arthur Lyon, of Windmill-street, Finsbury, Middlesex, sausage-machine manufacturer. Improvements in machines for reducing or mincing meat and other solid edible substances.

2643. Luke Turner, of the firm of Hodges and Turner, of Leicester, manufacturers. An improvement in weaving elastic fabrics.

2644. Francis Archer, of Bishopsgate-street, London, and William Papineau, of Stratford, Essex, manufacturing chemist. Improvements in distilling peaty, schistose, bituminous, and vegetable matters.

2645. Robert Adams, of King William-street, London. Improvements in fire-arms called revolvers.

2646. Edward Strong, of Carstairs, Lanark, North Britain, engineer. Improvements in removing and replacing the wheels and axles of locomotive engines and other rolling stock of railways.

Dated December 16, 1854.

2648. Peter Joel Livsey and William Weild, both of Manchester, Lancaster, engineers. Improvements in cartridges and projectiles, and in the construction, mounting, and working of ordnance.

2650. John Hickman, of Birmingham, Warwick, manufacturer, and Isaac Smith, of Birmingham, machinist. A new or improved stop-cock.

2652. Matthew Curling Friend, of Ashburnham-grove, Greenwich, lieutenant in the Royal Navy, and William Browning, of Minories, Middlesex, philosophical instrument maker. An apparatus for determining the magnetic aberrations occasioned by local attraction.

2654. William Eassie, of Gloucester, railway-contractor. Improvements in means of stopping or retarding vehicles used on railways.

2658. Leopold Wimmer, of Vienna, Austria, baker. Improvements in baking.

Dated December 18, 1854.

2660. Charles Frderick Stansbury, of Cornhill, London. An improved life-car or buoy. A communication from F. Z. Tucker, of Brooklyn, New York, United States of America.

2662. William Hartley, of Bury, Lancaster, engineer. Improvements in safety-valves for steam boilers and in steam engines.

2664. Edwin Whele, of Birmingham, Warwick. Improvements in oil and other lamps.

2666. Louis Henri Frederic Melsens, of Brussels, Belgium, professor of chemistry and natural philosophy. Improved processes of saponification.

2668. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the extracting tannic acid from leather, and in preparing the leather for the manufacture of glue. A communication from Obadiah Rich, of Cambridge, Massachusetts, United States of America.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2683. William Donald and William Heginbotham, power-loom managers for John Ferguson and Co., of Carlisle, Cumberland. Certain improvements in looms. December 20, 1854.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 2nd,* 1855.)

1800. Julian Bernard. Improvements in the manufacture of boots and shoes or other coverings for the feet.

1830. William Vitruvius Greenwood and John Saxby. Improvements in signal-lamps.

1854. Aristide Balthazard Bérard. Certain im-

provements in the manufacture of gas, coke, and other products from coal, and in apparatus for that purpose.

1875. Richard Archibald Brooman. Improvements in obtaining motive power. A communication.

1878. Auguste Antoine Legras. An improved apparatus for regulating the level or flow of liquids.

1883. George Burch. Improvements in the manufacture of pulp.

1886. James Lamb Hancock. Improvements in machinery for draining land.

1890. Louis Napoleon Langlois and Jean Baptiste Clavières. A new mode of constructing steam boilers.

1893. John Fisher Williams. Improvements in joining cast iron tubes.

1921. Pierre André Decoster. Certain improvements in extracting the saccharine parts of the sugar-reeds and of other sacchariferous substances.

1930. William Hill. Certain improvements in doubling or twisting net or raw silks.

1976. John Rigby. Improvements in fire-arms and guns, and in waddings to be used therewith.

2058. Henry Alexandre Genetreau. An improved system of carriage-shafts, poles, or beams.

2403. Ismaël Isaac Abadie. Certain improvements in the mode of working screw-propellers.

2493. John Henderson. Improvements in the manufacture of carpets.

2534. Robert Christopher Witty. Improvements in illumination by means of artificial light.

2543. Edward Dowling. Improvements in weighing-machines, and in their application to implements of transport.

2566. Edward De Mornay. A new construction of guns, and a new form of projectile peculiarly applicable to such guns, but which can be also used for ordinary guns.

2584. Edward Acres. Improvements in drying wheat and other grain.

2598. James John King and Thomas Brindley. Improvements in cigar-cases, card-cases, and other similar cases.

2609. Alfred Vincent Newton. An improved manufacture of conducting wire for electric telegraphs. A communication.

2634. William Charles Day. Improvements in portable camp-bedsteads and bedding.

2643. Luke Turner. An improvement in weaving elastic fabrics.

2666. Louis Henri Frederic Melsens. Improved processes of saponification.

2683. William Donald and William Heginbotham. Certain improvements in looms.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty - one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed December 29, 1854.

3. Alfred Dawson.
1431. Edward Joseph Hughes.
1462. Jean André Cécile Nestor Delpech.
1464. Joseph Marie Bardet and François Collette.
1468. Henry Heycock.
1469. David Bowlas.
1472. Louis Joseph Cheval.
1479. Samuel Harvard and Joshua Womersley.
1526. John Knowelden.
1620. Edward Francis Hutchins.
1632. Peter Spence.
1707. William Gossage.
1761. William Woodcock.
1846. James Lamb Hancock.
1922. Thomas Craddock.
1959. Samuel Frearson.
2035. Auguste Edouard Loradoux Bellford.
2080. Frederick Clark.
2095. John Nelson Gamewell.
2167. Joseph Burdekin Jackson and William Bowler.
2206. William John Bisseker.
2258. John Penn.
2308. Robert Stirling Newall.
2323. Alfred Vincent Newton.
2368. William Edward Newton.

Sealed January 2, 1855.

1449. Benjamin Walters.
1456. Urbain Chauveau and Charles d' Epinois.
1501. Thomas Waller.
1507. Thomas Schofield Whitworth.
1516. Matthias Walker.
2021. John Cunningham.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Nov. 30	3666	E. B. B. Wren	Tottenham-court-road	Portable bedstead.
Dec. 1	3667	C. Weintraud, Jun.	King-street, Cheapside	Fastening for porte monnaies.
7	3668	T. Jones	Clement's-lane	Turn-out bedstead.
9	3669	W. Collinson and H. P. Mather	Staffordshire	Elastic boot.
18	3670	W. Dicks	Weedon, Northampton	Screw-jack.
19	3671	Price's Candle Company	Vauxhall	Army-stove.
23	3672	J. Revell	Newark	Steerage horse-hoe.
28	3673	W. Russell	Darlington	Air-tube coach-lamp.
1855. Jan. 1	3674	J. W. Astles	Worcester	Boot-leg.
3	3675	G. Dowler	Birmingham	Cigar-magazine.

LIST OF PROVISIONAL REGISTRATIONS.

Nov. 30	625	F. and W. Collins	Fleet-street	Show-card.
Dec. 4	626	D. G. Grove	Birmingham	Show-card stiffener.
9	627	T. J. Mason	Wood-street	Elasticated stock.
,,	628	J. Wilson	Islington	Planing apparatus.
11	629	C. A. Gardner and R. Smith	Blackfriars-road	Camp-stove.
,,	630	C. A. Gardner and R. Smith	Blackfriars-road	Cottage stove.

NOTICES TO CORRESPONDENTS.

H. Hope.—We will attend to your letter shortly.

Engineer.—We acknowledged the receipt of your paper in No. 1635.

R. Cherbonneau.—The object we had in view in allowing the discussion of the moon's motions in our pages having been accomplished, as we find by several communications recently received, we cannot at present insert correspondence in continuation of the subject.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166 Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co, Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No 1640.] SATURDAY, JANUARY 13, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

BAYLISS'S PATENT SMOKELESS FURNACE.

Fig. 1. Fig. 5.

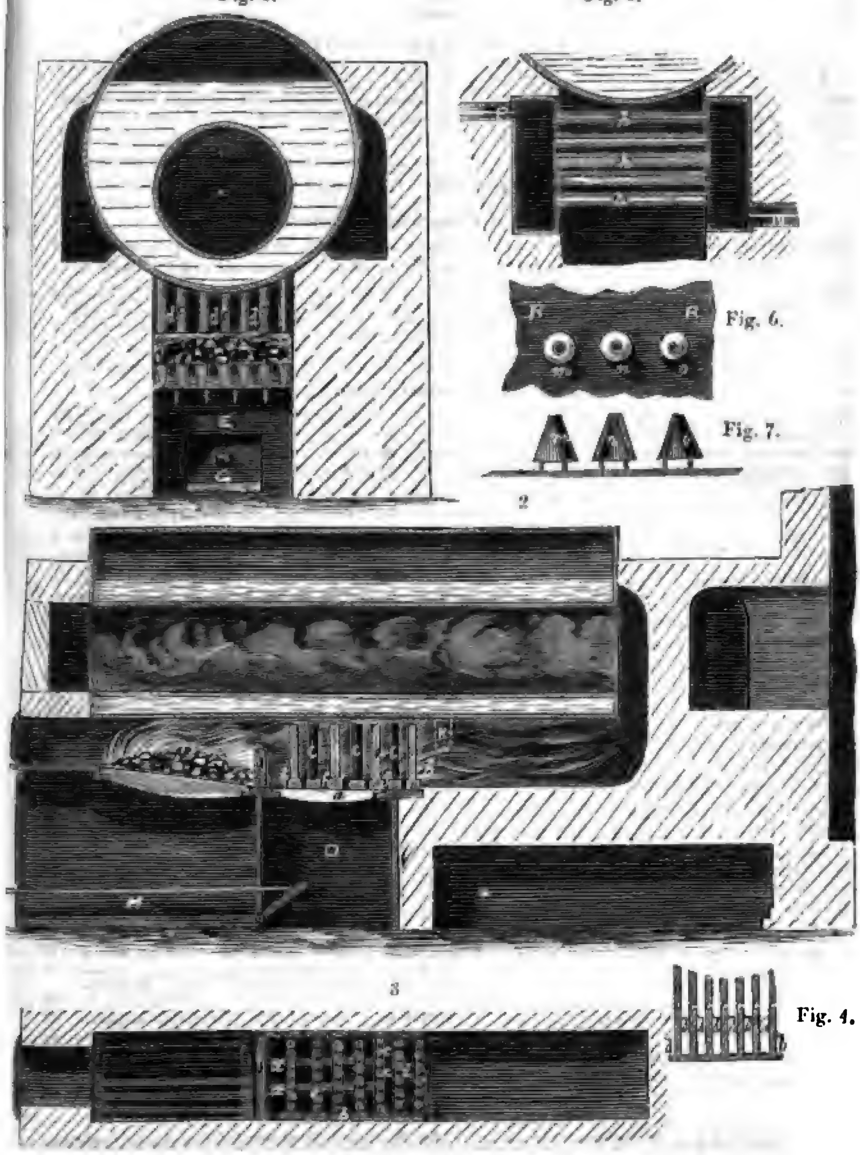


Fig. 6.

Fig. 7.

2

3

Fig. 4.

BAYLISS'S PATENT SMOKELESS FURNACE.

(Patent dated April 16, 1853.)

THE engravings on the preceding page represent a furnace constructed with certain improvements which were patented on the above day, by Mr. Bayliss, of London. The objects sought by the inventor are set forth as follows:—"First. Perfect combustion of the gases arising from the heated fuel in steam-engine and other furnaces, for the purpose of preventing smoke and economising coal. Secondly. To retain within such furnaces much of the heat which now passes away to the chimney without producing any useful effect. And thirdly. To facilitate evaporation by causing a rapid circulation in the liquids to be heated."

"Touching the first part of these improvements," he continues, "the principal gases we have to deal with in a furnace are carburetted hydrogen, bi-carburetted hydrogen, and carbonic oxide, the atoms of which must be chemically united with oxygen derived from the air, and be supplied with the requisite temperature, before combustion can take place. The difficulty hitherto has been to accomplish this union, for the gases, sweeping along in a body towards the chimney with great rapidity, at the rate of about thirty feet per second, there is not sufficient time for a thorough mixture of them with the air to take place, at all events, while in contact with the degree of heat necessary for their ignition. I therefore propose to compensate for this want of time by intercepting the gases on their way from the fireplace to the chimney, dividing them into a number of small streams or bodies, and forcing them into mechanical mixture with air, rising in small currents, in order to facilitate the chemical union of them with oxygen, and produce a combustible mixture, and to do this in such place and manner as to ensure the necessary heat for their combustion."

Fig. 1 of the engravings represents a transverse section, fig. 2 a longitudinal section, and fig. 3 a sectional plan of the furnace. In place of the ordinary fire-bridge, the inventor employs an air-chamber, D, formed by two cast-iron plates, E, F, built in or otherwise fixed to the walls or sides of the furnace. G is a door, hung on the plate, E, for regulating the admission of air to the chamber, D, and actuated by the rod, H. The upper part of the plate, E, serves as support for the fire-bars on one side, and the bearing bars, *a*, on the other. The upper part of plate F consists of an iron dead plate, extending across the furnace, intended to prevent the air from the chamber, D, reaching the flues, without first being incorporated with the gases. *a a* are bearing bars, laid lengthwise from side to side of the air chamber, and are kept secure in their places by being simply dropped in slots prepared for them. *b b* are a series of "admixers and heat-retainers," consisting of rows of solid bars of any convenient form, of metal or clay, or any suitable fire-resisting substance, having spaces, *d*, between them, of sufficient area in the aggregate for the passage of the products of combustion; and the rows of admixers being placed a distance apart, having spaces, *f*, between them for the admission of currents of air from the chamber, D, to commingle with the gases. J is a fence extending across the furnace to prevent the fuel getting amongst the admixers, and is retained in its proper position by means of projections on the under side, one at each end, which fit into holes in the top of plate E, on which it rests. K, shown in dotted lines, is a deflector for throwing the flame downwards, and giving it an extended sweep under the rest of the boiler; but this may be dispensed with, not being essential to the action of the apparatus.

"It will be seen," says Mr. Bayliss, "that the gases cannot fail to be brought into the most intimate mechanical mixture with the air, in the endeavour to find their way through the numerous channels presented to them by such an array of bars, and the agitation consequent thereon; and as the bars become red hot, and form besides a great natural harbour for heat, a steady combustion goes on from one end of the admixers to the other." A vertical section of a row of admixers is represented separately at fig. 4. Perforated plates of metal or slabs of fire-clay might be used instead of the admixers already described, and these admixers may be placed vertically or horizontally, as is thought best. The inventor prefers having them made of cast iron, when the heat of the furnace is not so intense as to burn them away too rapidly, on account of the cheapness of the metal, and the facility it offers for renewing them. For furnaces of very high temperature the plan shown in vertical section at fig. 5 may be adopted with advantage. This arrangement is composed of two vessels of plate iron, L, M, built in the sides of the furnace, and connected together by metal pipes or tubes, *h*, which serve as admixers, &c. A pipe, N, communicates with the force pump, and another pipe, P, with the boiler, "and thus all the water that enters the latter must pass through the tubular admixers, and, by absorbing the heat, prevent them from being burnt away. This method has the additional advantage of heating the supply water, which would prove a further source of economy in the expenditure for fuel."

"The second part of my invention," says Mr. Bayliss, "is to extend the 'admixers and

heat-retainers' to the end of the boiler, and again, if thought desirable, through the 'internal tube.' These being maintained at a red heat by the passing flame and heated gases, will give off, by radiation to the surface of the boiler, a great quantity of heat, which would otherwise pass up the chimney and be wasted; they will form, in fact, a continuous fire from one end of the boiler to the other, and tend to spread the heat more uniformly throughout the furnace. For evaporating pans, such as those used in the manufacture of salt, for example, where slow combustion and uniform heat under the whole surface are desirable, I believe this part of my invention will be found of great practical use."

The third part of this invention is shown by figs. 6 and 7, the former being a plan, the latter an elevation. R, R, is a portion of the bottom of a boiler or evaporating pan; *m*, *n*, *o*, hollow cones, open at top and bottom, as shown by *n*, which is a section of one of them. They are supported on legs, and fixed just above the surface of the boiler or pan, so as to leave a free passage for the liquid underneath and through them, and should be sufficiently heavy to maintain their positions by their own gravity, or a number of them may be fixed to bars of iron, which bars may be fastened down in any convenient manner, and in this case the legs will be unnecessary. The object is to produce ascending and descending currents in the liquid to be heated, for the purpose of carrying off the globules of steam from the heating surface as fast as they are formed, which will have the useful effect of accelerating its evaporation, and protecting the iron from being burnt. The action of this arrangement is thus described by the inventor:—"On heat being applied to the bottom of the boiler or pan, it expands the liquids in the cones, and causes upward currents, when the cooler liquid outside the cones rushes downwards to supply the place of that which is ascending, and thus ensures a rapid and continual circulation, and a quicker diffusion of heat."

ON PERMANENT WAYS.

(*Concluded from page 7.*)

The improvements the Company profess to hold are as follows:

"FIRST.—Those directed to the better mode of securing the joints of the rails of the ordinary form; by which means a more even and safe road is obtained, while the cost of the labour of maintenance is greatly diminished.

"SECOND.—The substitution of cast iron in lieu of timber in the substructure, so as to avoid the heavy expenses attendant on the renewal of wood sleepers. And,

"THIRD.—The employment of wrought iron for the entire construction of the road; a material which, from its strength, durability, and non-liability to fracture, appears well adapted to the purpose."

With regard to joints, their principle are the fish joint, before mentioned, and Mr. Peter W. Barlow's cast-iron sleepers to be used without timber, and bolted in two halves beneath the rails connecting them together, by means of their separate chair heads.

Fish jointing consists in placing two pieces of cast or wrought iron bar, about 18 inches in length, one in each side channel of the rail, something similar to the wooden fishes which are applied to spars when sprung at sea. These side fishes are bolted to, and through, the rails, or they may be applied so as to connect together two chairs, with a sleeper under each, and keyed in the usual manner. The method of applying them with chairs is probably the best, though the most costly, as thereby the cross-tie of the joint is rendered firmer, and better able to resist the lateral thrust of the wheels. But this mode requires better workmanship than the former. The fishes are made to bear at their edges against the upper and lower tables of the rails, and a space is left between the fish and the vertical rib of the rail. Thus, when the bolts are screwed tight there is a springing action lengthways of the bolt, which tends to keep it tight, and prevent jamming.

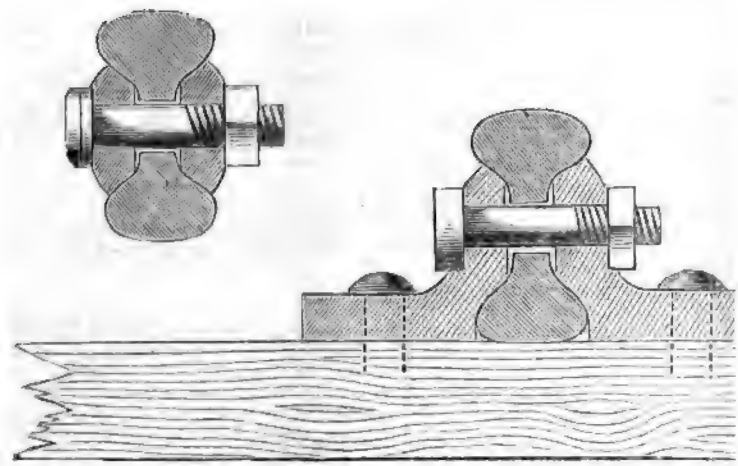
In every case the cross sleepers should be brought as close as possible to the ends of the fishes, leaving the joints suspended, so that the cross-tie will be made; and, above all, there should be ample metal applied. But it sometimes happens, that for purposes of false economy the wrought iron is diminished in weight, and instead of an extra sleeper being applied, the joint sleeper is occasionally removed, and the intermediate ones are brought a little nearer together.

Two evils occur with this joint. By the working of the fishing plates, they bend vertically, and the joints become permanent surface hollows, perpetuating a series of waves through the whole length of the way. The other evil is, that by the removal of the cross-ties from the joints, they are exposed to the lateral blows of the wheel flanges, which occasionally break off the nuts from the bolts, leaving the joints loose.

To guard against this contingency and risk, Mr. Adams has lately devised a new

system. It should be here understood that no form of joint is satisfactory that does not practically connect two rails into one, independently of all aid from the sleeper (save as a cross-tie and bearer), precisely as two lengths of a fishing-rod are effectually made one by the ferrule embracing them. The ordinary joint chair does not do this, because it depends materially on the wooden key for the security of the rails. And connected with this question also is the consideration, how we may best secure the rails to the sleepers. It will be at once seen that the greater the elevation of the rail above the surface of the sleepers, the more it is exposed to lateral blows and displacement, and the broader and longer must be the base of the chair to support it. With ordinary chairs, the bottom of the chair must be 2 inches in thickness to prevent its splitting across with the weight of the engine. This makes the height of the rail 7 inches above the sleeper.

Instead of the joint chair, Mr. Ad his improved plan, applies a pair iron brackets formed with a vertic from 15 to 18 inches long, filling th nels of the rails, and with a broad ho foot to bear on the surface of the at the level of the lower side of t Thus the surface of the rail is broug to within 5 inches of the sleeper in 7. The two brackets are bolted through the rails by two bolts an diameter, and they are treenailed or down to the joint sleeper as usual all the advantages of the fish are co in our judgment, with a perfect c while the stress on the rail is less its being lowered two inches. Th and two bolts to each joint, are d with by disposing the iron of the joi with a small additional weight, in t of brackets. The annexed engravin the two plans, the rails being rep at their respective heights above the The saving in first cost by the brack



as compared with the fish-joint, will be about from £50 to £100 per double mile, according to the method adopted.

In the estimate of the Company, a comparison being made between a line laid in the ordinary mode with joint chairs, and one with fishing process, the latter is made to appear the lower in cost. This is accomplished by getting rid of the joint sleepers and joint chairs altogether; in short, by reducing the total number of sleepers, and thus diminishing the bearing surface below the rails. This is robbing Paul to pay Peter; but we incline to think that Peter will not find it pay in the long run,—certainly not in the heavy run of engines over it. It is not by diminishing the weight of rails from 72lbs. to 65lbs. per yard, nor by ab from the number of the sleepers er that the Company can acquire a le title to put forth a circular on Pe Way, or claim credit for their prop The great fault in Permanent Way insufficiency of material as well as equal distribution of it. It is stra the Company who appositely quo Mr. Clark's "Railway Machinery" nently on their title-page as to "e economy in permanent way," sh their text, so wholly disregard his reasoning.

With regard to the proposition Company to use cast iron sleeper sive of timber, we can see little in

tem, save a much greater outlay in first cost, for a result more than questionable. There is no doubt that iron sleepers may be made, and made durable, but only with a mass of material far exceeding the statements of the Company. Moreover without timber to absorb their vibrations, the rails would be very rapidly destroyed. Timber, or some other material capable of absorbing vibrations, must in all cases be used in connection with the iron, or it would be simply a return to the stone-block principle, with a more costly material than stone. Except for localities where supplies of timber cannot be obtained, or maintained, we think cast iron sleepers are a costly mistake, and for such localities we do not think the Company have been discreet in their selection of forms.

The third variety of the Company's improvements—the proposed employment of wrought-iron rail wholly independent of sleepers of other material—we cannot regard as a practical suggestion.

Apart from the question of the best form of rail to produce lateral and vertical rigidity, there is the other question, of how we may best hold the rail firmly to the substructure. If capital were unlimited, the best structure would be one composed of timber sleepers firmly bolted down to a series of heavy stone blocks, precisely upon the same principle that a heavy stone foundation is placed below a machine for a factory. Cross and longitudinal sleepers are both good, inasmuch as they are both sunk into the ballast, and are thus held down. If the ordinary cross-sleepers could be doubled in size, and their distance apart, from centre to centre, be reduced to two feet, we should obtain a very firm road, not likely to spring or get loose. The Barlow rail proposed by the Company is not of this character. It is, mechanically speaking, a modification of the bridge rail, and not a good modification, for it lessens the vertical strength without adding to the horizontal. To make this rail really effective would require more iron than has yet been applied to it, and its form precludes it from lying fast in the ballast, while there is great difficulty in producing firm joints, and it is without means of absorbing the vibration. As a matter of economy, it would appear that the destruction of its upper or rolling surface by wear, involves the waste of a greater mass of material than any other form. We are speaking of the solid rail; for in plans for fastening down bridge and foot rails on bent iron plates, on plates bent moreover into the form of a trough, involving therefore unsteadiness, we have no faith.

The consecutive plans given in the circular bear out our remarks. One engraving (plate 7) shows the largest sized rail without sleepers, riveted together at the ends, like a piece of boiler plate, in a wide saddle or strap, the two rails being connected by cross angle irons, from seven to eight feet apart, to preserve the gauge. This strongly resembles a long ladder laid on the surface of the ground. In another place (plate 8) the ends are fastened down by spikes to angular cross sleepers of timber. And again (plate 9), wrought iron transverse sleepers are riveted to the rails, as a substitute for timber, and in a similar form. It is stated that these rails are made from 74 lbs. to 126 lbs. weight per yard. We believe that a common bridge rail of 90 lbs. per yard, measuring 4 inches in depth and 6 inches in breadth, would be found greatly superior to any of the Barlow forms. In the circular is given a list of forty-five railway companies who use the patented improvements of the Permanent Way Company. It would have been as well, and more satisfactory, had the number of miles employed by each, and the peculiar improvement adopted, been specified. We recommend to our readers, in conclusion, the perusal of the numbers of Mr. Clark's work on Railway Machinery, quoted at the head of this article, for valuable considerations respecting both the theory and practice of the Permanent Way.

ON THE INCRUSTATION OF STEAM BOILERS.

BY M. COUSTÉ.

In the *Annales des Mines* for the present year, is an interesting paper by M. Cousté on the incrustations of steam boilers, and the methods for preventing their formation. He commences by pointing out that the prevention of incrustations, if realised, would produce a better preservation of the boilers, greater security against explosions, and considerable economy in fuel. For steam vessels it would be attended with an increase of available space for cargo, and the use of steam at high pressure.

He then presents the results of his investigations on the nature of deposits, and the circumstances connected with their formation, whether in boilers fed with salt or fresh water.

M. Cousté suggests four methods for preventing incrustations. The first is, in fact, the well-known method, which consists in extracting from the boiler, either at intermittent periods, or in a continuous manner, a certain quantity of water saturated with solid matter. He thinks this process imperfect for low-pressure engines, and quite

useless for those at high-pressure. He proposes, however, to make some further improvements in it, as the greater number of marine steam-engines work at low-pressure, and may thus be in some measure benefited.

The second of the methods described is called by M. Cousté *alimentation nonhydrique*, and requires the use of Hall's condensers. The principal objection to this method is the existence of a counter pressure in the cylinder during too considerable a part of the stroke of the piston. By calculation he finds that from about 25 to 30 per cent. of force is lost in a low-pressure engine.

The third method consists in continually employing the same water for condensing the steam, and of course requires that this water must continually pass through a refrigerating process.

The fourth method, which belongs entirely to M. Cousté, consists in feeding the boiler with water heated to a very high temperature (at least 318° Fah.) before being introduced into the boiler. This process has the effect of completely precipitating all the calcareous salts held in solution by the water.

The process requires a special heating apparatus, and a filter for separating the precipitate. The author remarks that the filtering which is necessary for engines at ordinary or low pressure, or for high-pressure engines working occasionally, might be dispensed with for marine high-pressure boilers, because the salts precipitated in the heater cannot again dissolve in the boiler, and consequently cannot crystallize, but will only form a muddy deposit instead of a fixed incrustration.

Finally, in comparing these different methods, M. Cousté thinks the last should be preferred for navigation, whether in salt or fresh water, and exclusively employed for locomotives; while the third more cumbrous method could be advantageously used for land engines under certain locally favourable conditions.

In order accurately to estimate the value of keeping the surfaces of boilers clean and free from incrustation, M. Cousté has mathematically investigated the loss of heat which takes place in causing the water in an incrustated boiler to arrive at a given temperature. He does this by comparing two boilers of the same shape and dimensions, placed under precisely the same conditions, except that one is covered with a calcareous incrustation all over its heated surface, while the other was free from deposit, and covered only with a thin coat of rust. They are supposed to be so managed as to produce equal quantities of steam in equal times. It follows that the heat of the fire under the incrusted boiler must be increased; hence a great loss of heat by the rarefied air and gas escaping through the chimney, and by the external radiation from the furnace. The first of these causes of loss is, of course, the most considerable, and it is it alone that the author has sought to estimate. This he does by the aid of some hypotheses, which enable him to establish his fundamental equations. From these he finally deduces the formula:

$$\frac{\mathrm{II}}{\mathrm{P}} = \nu\,(1+2\,\mathrm{M}\varepsilon)$$

where II represents the loss of heat in the incrusted boiler due to the causes mentioned, P the loss in the non-increased boiler, ε the thickness of the calcareous crust, and

$$\mathrm{M} = \frac{\frac{\mathrm{K}}{\mathrm{K}'}\left(1 - \frac{b}{\mathrm{A}}\right)}{e + \frac{\mathrm{K}\eta}{\gamma}}$$

in which K is the co-efficient of conductivity of the boiler plates, K′ of the calcareous crust; *b* the temperature of the water in the boilers; A the mean temperature of the heated surface of the non-incrusted boiler; *e* the thickness of the boiler plates; η the thickness of the coating of rust, and γ its co-efficient of conductivity.

By the aid of these formulæ the loss of heat occasioned by incrustation in steam boilers covered with deposits not exceeding two-tenths of an inch in thickness is calculated to amount to 40 or 50 per cent.

That a considerable loss must be produced by boiler incrustations is thus proved, but it seems to be somewhat exaggerated. One result of these calculations seems, however, to be well established, namely, that the consumption of fuel increases rapidly with every increase in the thickness of incrustation.

M. Cousté makes highly interesting remarks on the nature and formation of the deposits. He distinguishes the deposits of marine boilers from those fed with fresh water. The former consist chiefly of sulphate of lime, and contain not a trace of carbonate of lime, while the latter are formed both of sulphate and carbonate in proportions varying with the localities.

He also distinguishes deposits which are merely muddy, or formed of matters suspended but not dissolved in the water, and which are formed of magnesia, oxide of iron, silica, &c., from the crystalline deposits which commence to form when, during the progress of evaporation, the water has arrived at a state of saturation with respect to the salts forming the deposits.

An important fact resulting from M.

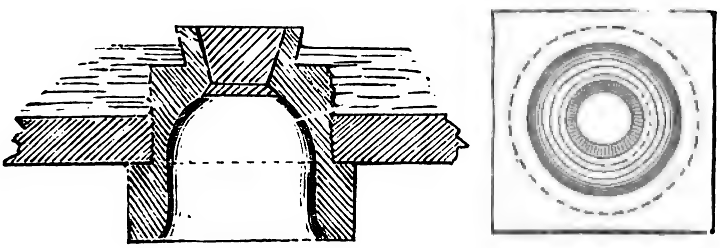
Cousté's observations is, that the state of saturation is brought about the sooner the water attains a high temperature; that is to say, that the solubility of the sulphate and carbonate of lime diminishes in a rapid proportion as soon as the temperature rises above the boiling point. Between this and the freezing point, the former of these salts has for temperature of maximum solubility 95° Fahr., and at 212° its solubility is not much greater than at 32°. Hitherto the law of its solubility beyond the boiling point has not been examined; and M. Cousté is perhaps the first person who has shown that at temperatures somewhere about 320°, which corresponds to a steam pressure of four or five atmospheres, the solubility is almost destroyed. Upon this fact is founded the principal method proposed by M. Cousté for remedying the formation of incrustations.

He also explains by this circumstance the difficulties which have hitherto interfered with the use of high-pressure engines on board sea-going vessels.—*Journal of Industrial Progress.*

FORSYTH'S IMPROVED FURNACE AND BOILER.*

It is proposed by the author to make the grate a weighing-machine, lowering and rising according to the weight; that is to say, when a charge of coal is put in the furnace, the grate is thereby depressed, and by the coal gradually burning away, the grate is elevated as the weight upon it diminishes. From this weighing-machine connections are made to the valves for admission of air to the flue, which open and close by the action of the weight of the coal, thus effecting the necessary variation, but preserving the necessary relative quantities and conditions, and thereby avoiding smoke by obtaining perfect combustion. A series of openings for the admission of air are made on each side of the cylindrical portion of the boiler, each opening being constructed with a ring round it, like a fire-door opening, and faced with a grating, upon which the regulating-slide works. The fire-grate has a fire-brick casing sliding up and down freely with the grate inside the fire-box, which is suspended by spring balances, provided with adjusting screws for the attendant to have the means of correcting, for accumulation of clinker on the bars, wearing away of the fire-brick casing, fire-bars, &c., &c.

The fusing-plug, to prevent injury to boiler from scarcity of water, is shown in the fig. below, and is made of a large brass bolt (in which the fused metal is soldered),



cupped on the fire-side, so as to bring the lower side of the tin or "lead plug" within it, some distance above the water-side of the roof-plate, thus leaving a margin, and allowing the plug to be fused while there is yet sufficient water upon the plates to prevent their being burned, and to drown out the fire after the plug has been fused.

In the writer's experience of many thousand fusing-plugs, he has not found any which could be depended upon, except those that he has constructed and applied according to the above principle.

To prevent the destruction of boilers from galvanic currents, which the writer has many opportunities of observing, he proposes to adopt generally the use of a piece of zinc, in metallic contact with the boiler plates, and to be renewed from time to time as required; this practice he believes has been successfully applied in iron ships, and for other purposes, but not generally used in steam boilers.

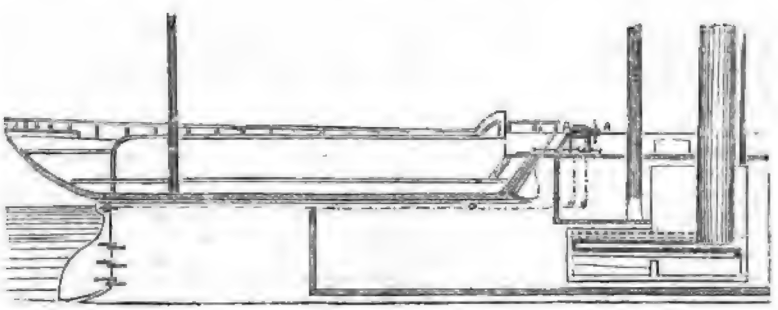
* From a paper recently read, by the inventor, before the Institution of Mechanical Engineers, Birmingham.

To prevent the escape of useful heat, the chimney is made multi-tubular, and converted into a feed pipe, receiving its water at the top, and delivering it to the boiler at the bottom, by which the flue temperature at the outlet is reduced even without producing any cooling effect upon the boiler, the spare heat being abstracted for a useful purpose.

In large engineering and other works, where many forges and furnaces are in operation, it is proposed to run from a cold-water tank a main or pipe with ball taps, and small tanks to supply the tuyeres of the several forges, &c., with cold water; and as this water becomes heated, to draw it off by a main feed-pipe with a force pump into the tubular chimney feed-pipe; also to case the chimneys and hoods of the forges with water, for the double purpose of keeping the shop cool in hot weather, and obtaining the waste heat for useful application. The feed-pipe chimney to be provided with a safety valve to prevent it bursting, if at any time the pump be in action when the valve to the boiler is closed.

BURCH'S IMPROVED SAFETY SHIPS.

Mr. Burch, of Crag-hall, near Macclesfield, proposes to build ships in two distinct parts, having the appearance, when together, of one perfect vessel. The larger or parent part is to be the great body of the ship, containing the whole length of keel, main and fore masts, hold, space for machinery and cargo, fore cabin, berths, &c., &c.; the lesser, or escape part, to contain berths, saloon, victualling stores, treasury, &c.; and to have the form of, and to be, a perfect vessel of itself. It is to carry the mizen mast, and is to be a substitute for, the quarter and after decks of the parent vessel, occupying the deck space from the stern up to about the main mast, and down to or about level with the water line, and so arranged and fixed upon the parent part of the vessel that, in cases of shipwreck or fire, it may without difficulty be launched off the stern of the parent ship. The stem and bows of the escape vessel form the stern and counter of the parent vessel. In order to make a secure berth for the escape vessel while on board the parent vessel, and also to protect it from the force of the waves, the sides of the parent vessel are to be raised above the water-line up to about the gun-



wale, forming a kind of trough, which may terminate obliquely about the sternpost of the parent vessel; and in this trough the escape boat or vessel is to be securely placed, with her head projecting over the sternpost of the parent vessel, and always in a position ready to be launched. To facilitate the lauching, under circumstances where this is required, while the parent vessel still floats, the inventor proposes that the hold of the parent vessel should have a water-tight bulk-head division astern, and that the compartments thus formed shall be provided with plugs or valves for the purpose, when necessary, of letting in water; and in the event of the parent vessel being wrecked, or on fire, and all hope of saving her appears lost, the plugs or valves are then to be opened, when the after part of the parent vessel will begin to fill and sink, and the escape part can then, without difficulty, when loosened from her fastenings, float off the wreck. Only sufficient water is to be admitted to enable the escape vessel to float off, or sufficient in cases of fire to extinguish the flames, and to avoid the loss of the larger vessel, while a hope remains of saving her. Mr. Burch recommends the employment of self-acting valves, which close in sufficient time to prevent the vessel from sinking; so that, if after all she survives the threatened danger, the escape part

can again be re-adjusted on her stern, the water pumped out, and the perfect ship reach her destination in safety.

The fastenings by which the two vessels are to be bound together are of the simplest kind, in order that a separation may be made within a few moments after the order to let go is given; but of sufficient strength to keep the escape vessel well secured in heavy, stormy weather. Various modes may be adopted, but that which is recommended as amongst the simplest and most effective, consists in employing strong hook-bolt fastenings attached to each side of the stern of the escape vessel, and corresponding fastenings fixed to the deck of the parent vessel; so that by means of short-noosed cables with tightening block and falls, the two vessels may be securely held together. "The same means may," says the inventor, "be adapted at the sides, if necessary, but as the rising trough sides of the parent vessel will be exposed to, and receive the pressure of the sea, the stern fastening may be found sufficient, and although the stem and bows of the escape vessel will be exposed to the sea, her own weight will probably be found sufficient to keep her down; should she lift, however, the result will not be disastrous, for the water will immediately rush up the trough between her and the parent vessel, and act as a water buffer as she again settles in her place." Under all circumstances, he recommends rope fastenings, and where they are placed he would have a small hatchet chained, so that in case of any entanglement of the ropes, all the noosed cables might be simultaneously severed. The inventor says, "In cases of shipwreck from fire, or striking on sunken rocks, such as the loss of the *Amazon* and *Birkenhead*, I do not hesitate to say, that had those vessels been provided with this means of escape, almost every person who then perished would have been saved; and during the late wreck of the *Queen Victoria* its services would have been equally effective. The captains and crews of vessels, having the means of escape at hand for themselves and passengers, will neither lose energy nor presence of mind; there will be no scrambling into, launching, and swamping unseaworthy boats; every effort will be made to save the parent vessel, which in some instances need not be abandoned until she even sinks away from the escape part. Of course, there are circumstances in dreadful storms, when no human aid or contrivance could rescue the doomed vessel and her unhappy living freight; the mercy of Providence alone can then save; but from such disasters at sea as fire, leakages, striking on sunken rocks, shoal waters, sand banks, collisions, and many other casualties by which so many vessels and lives have lately been sacrificed, and so much valuable property lost, I venture to hope that this invention may prove, under these circumstances, a sure means of escape. It will also be found useful in the Arctic regions, and likewise in exploring rivers, where, in shallow waters, the parent vessel could not float. It may be constructed to receive a small engine, and thus be made available for many other useful purposes."

IMPROVEMENT IN GUNNERY.

A novel and important improvement in gunnery was exhibited on Tuesday last, when a series of experiments were made by the inventor, accompanied by several gentlemen, with a cannon constructed to propel chains and shot in any given direction. The gun is of a peculiar construction, and the chain and shot, when discharged, expand to the full length of the chain, and carry everything before them, so that a column of men might be swept down at an explosion. We cannot particularise the secrets of the invention, which have not yet been made public; but to give some idea of its destructive power, we will describe the result of the experiments brought under our notice. The ground selected was a plain in Battersea-park; the cannon used were diminutive models, 9 inches in length and one inch bore. One shot was attached at either end of a chain, 9 feet long; the guns were raised 2 feet above the level of the park, and two targets were placed 20 yards distance to fire at; between the targets and the cannon a number of large sticks were driven into the earth, to resemble a column of men. These arrangements perfected, the inventor applied the match; the powder instantly ignited, and the guns exploded with the desired effect, every stick being swept down; and had there been as many Russians before it as there were sticks, they would have been sent to the land of shadows. The experiment was repeated several times with the same results; and had the chain been 60 feet instead of 9 feet long, and the cannon of proportionate dimensions, we are convinced nothing within their range—men or horses—could have remained 2 feet above the ground. We understand the inventor can unite two, three, or more cannon together, pointed as arrangements of an attack or defence might require, and cause them to explode instantaneously by the application of one match. The perfection of such a system of gunnery would, in the present state of our warlike relations, prove of inestimable advantage, and create a new era in the ordnance department of the em-

pire. We understand the inventor is Mr. Thomas Spargo, of Adelaide-chambers, 52, Gracechurch-street, City.—*Mining Journal.*

M'CORMICK'S REAPING-MACHINE.

SUCCESSFUL ACTION FOR INFRINGEMENT OF MR. M'CORMICK'S PATENT IN AMERICA.

It is necessary that English agriculturists and others should be made aware that Mr. M'Cormick has gained the verdict of the Circuit Court of the United States for the Northern District of New York, and a jury, in an action for infringement of his patent, against Mr. W. H. Seymour, and Mr. D. S. Morgan, who are said to have been strongly supported in their resistance to Mr. M'Cormick's claims. We have before us, in the *Semi-weekly Tribune*, of December 8, 1854, the speech of the plaintiff's counsel, Mr. W. H. Seward—a speech of great merit, but defaced by that national arrogance to which America so much accustoms her orators, and by which they are so often made ridiculous.

The action depended upon the use, by the defendants, of the "divider;" or, as Mr. Seward denominated it, the "mechanical man," which, wherever the machine goes, "goes before it, always stooping and lifting up, and disentangling and dividing the grain;" and of a "new location" of the reel standard, "accompanied by such devices as would make it support the axis of the reel so far in advance of the sickle as would allow the reel to co-operate in dividing, while the standard itself was out of the way in that operation."

The plaintiff's counsel concluded an elaborate address with the following remarks, which show that it is not in England alone that the commercial greatness of our country is attributed to the existence of laws, by which inventors have their rights secured, and their interests protected:

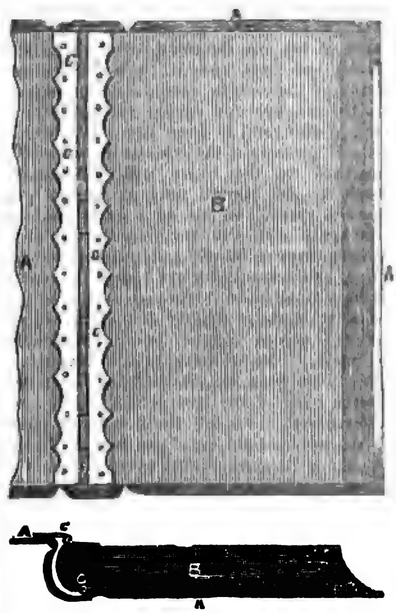
"Gentlemen, we are an ambitious people. We are emulous of Great Britain; we acknowledge no other rival. Great Britain has risen to her present high commercial and imperial position chiefly through the development of the inventive genius of her people. If we are to attain an equal or superior position, we must, in like manner, cherish the inventive genius of our countrymen. That policy is written in our constitution. You cannot deny justice to an inventor without violating that very constitution itself. The duty which I have myself performed on this trial has been a pleasing one, because I have been inspired by a zeal not only to secure justice in this case, but to maintain the laws and the constitution. Nevertheless, I envy you the nobler office which you have to perform. I can only plead for justice and national honour. You have the power to render the one and to secure the other."

The trial resulted in a verdict for the plaintiff, for 7,750 dollars.

IMPROVEMENT IN ACCOUNT BOOKS.

Messrs. Waterlow and Sons, the well-known stationers, have become the proprietors of, and are now introducing to the public a very valuable but simple improvement in the manufacture of account books, recently patented by Mr. Arnold.

The improvement consists in the employment of a metal hinge, C, as shown in the accompanying engraving, for fastening the



inside of the book, B, to its covers, A, in the place of the linen joints ordinarily employed. By this method the inside of the book is entirely independent of the covers, and may be separated from them by the mere withdrawal of the sliding hinge-pin, so that one cover may be used for several books, or new covers supplied at pleasure to an old book, without the necessity of the book itself being placed in the hands of a binder. The great objection to the common glued joints is their liability to give way under the influence of a damp atmosphere; but with the

improved hinge arrangement this is, of course, impossible. We should also mention that by the use of the metallic hinge, the pages of the book are allowed to lie quite flat, wherever it may be opened, an advantage which every accountant will know well how to appreciate. We believe the Messrs. Waterlow have wisely resolved to charge no more for books on the improved, than for those on the ordinary principle, trusting to the increased sale for suitable returns.

ON PARLIAMENTARY SMOKE.

To the Editor of the Mechanics' Magazine.

SIR,—I have now to reply to Mr. Woodcock's letter, in your Number of the 23rd December. He opens thus:—"First, to the assault of the Liverpool league, with its Cerberus-headed organ, *well concocted.* Mr. Mushet will find his required data in the forthcoming report of the two *Séances* at the Institute of Civil Engineers. 'Engineer' states nothing in his letters for remark. Now, therefore, to Mr. Williams's fulminations."

As to the "well-concocted assault," I know nothing; and as to your correspondents, Mr. Mushet and "Engineer," I neither know who they are, or what they are, or even where they live; never having seen, or had the slightest communication, verbal or written, direct or indirect with either. All I know is, that the letters, on the subject before us, signed *David Mushet*, have always been worth reading — intelligible and to the point, which certainly cannot be said of those from Mr. Woodcock, or his chemical tutor, Mr. Mansfield.

"And now," says Mr. Woodcock, "to the kernel of the question—can smoke be burned, or can it not? I fearlessly reply, yes! and advantageously. It makes extra fuel." Here we have, *apparently*, a manly and defiant challenge. Appearances, however, are often deceptive, and here they are peculiarly so. First, then, what is it which Mr. Woodcock so stoutly asserts *can be burned?* In a word, what is it he calls smoke? From his own pen, we learn that it is just what every one else (Mr. Mansfield excepted) calls *coal gas*. The problem, then, is very simple, and easily solved. "Only let me," says Mr. Woodcock, "give *coal gas* the name of *smoke*, and then, I fearlessly reply, *smoke can be burned*"—*mirabile dictu!*

To give plausibility to this theory (and jugglers are always plausible), Mr. Woodcock invents, or supposes, or assumes, that there are two kinds of smoke; viz., "*Parliamentary* smoke, and *true* smoke." This certainly is original, and deserves a patent. His own words are, "First, *parliamentary smoke*, or smoke as *popularly* understood. This is what a furnace-fire, covered with small coal" (and why not large coal?), "smothering all flame, emits. But Mr. Williams *pleasantly* calls it *gas*." Pleasant fellow that Mr. Williams. Again, "There is also another substance. Let us call it, 'TRUE SMOKE.' Mr. Williams" (in common with all authorities) "says, this the result of imperfect flame" (combustion), "and consists, for the most part, of steam, carbonic acid and nitrogen, and minute portions of carbon in suspension."—For this see Mr. Brande's letter, quoted in your last, page 15.

By this new doctrine, then, scientific inquiry is but complicative; and we are not to consider what is right, or true, but, as Mr. Woodcock does, take as chemical gospel what is "*popularly understood*" to be so! or, as Mr. Mansfield does, go to the inmates of the nursery for information. What an age of enlightenment will this simple doctrine produce!

Now, as to this parliamentary smoke (pleasantly called gas), Peckston, in his Treatise on Gas-light, says, "When pit-coal is burnt in an open fire-place, it emits flame which is occasionally exhibited in streams of peculiar brightness. This flame is *coal gas* in a state of combustion." "Not at all, not at all," says Professor Woodcock; "you may, as Mr. Williams does, '*pleasantly*' call it *gas;* but I tell you, it is neither more nor less than *parliamentary smoke.*"

Again—"Seeing that when coals are burned in the ordinary way we have evident proof that they contain inflammable gas, (inflammable smoke, by your leave, as Messrs. W. and M. have shown), which, if collected and properly applied would serve as a substitute for the light of candles, or oil, &c." Away with such pleasantries, says Mr. Woodcock, you must not so rob me of my theory, or my parliamentary smoke either. Do we not burn it and illuminate our streets and apartments with it?

Again, Peckston says,—"Mr. Winsor" (who first exhibited the nature of gas-light illumination) "proved experimentally that the flames of coal gas, when properly managed, *produce no smoke*, by allowing no more gas to pass through the burner than can be entirely consumed." Now here is the whole theory and practice of combustion in our furnaces, *without smoke.* Instead of one burner, or one jet, let the whole body of the gas generated be thrown into as many burners or jets as there are subdivisions or apertures, and thus all will be "*entirely consumed.*" Professor Brande says the same when he observes, "Each jet of air be-

comes, as it were, the source or centre of a separate flame, and the effect is that of so many jets of coal gas ignited in the air." What further illustration is required? Mr. Woodcock's own re-invention and application of my perforated air-distributor plate (if he looks into his furnace from behind) will satisfy him of these facts.

"My points," says Mr. Woodcock, "are, to encircle completely the *gases*" (encircle the gases!) "as they leave the furnace." This is an awkward *lapsus pennæ*, seeing that he had just before told us that these, so *pleasantly* called, *gases*, were not gases, but were *Parliamentary smoke*. But to go on,— "I encircle the gases with heated air, which I prefer to administer in *thin films, or through very small orifices*."—(He might have added —"as shown in Prideaux's furnace-door, and in the perforated plate used by myself,") "thus perfectly," he continues, "and not partially, applying the Argand principle," &c. I stop to ask Mr. Woodcock, as an honest man, can there be a more perfect description of my Argand furnace? and if so, either let him say so, or point out the difference.

And now, as to some of Mr. Woodcock's inuendoes. "Is it not surprising that Mr. Williams was once a profit-seeking patentee, yet so it is. When his patent expires, with the savage impotence of a toothless lion, or less noble beast, he would resist any further *improvement*." Softly, most vehement! First show your piracy is not piracy, but is an "*improvement*," and I will be the first to ask for a licence to use it. I do resist, however, and will continue to expose the audacity, either on the part of Woodcock, Prideaux, or others, of adopting and accurately imitating the principle, practical detail, and action of my now expired patent, to deceive the public and gain a dishonest profit, and by thus calling *improvement* what is unqualified piracy.

And now, as to my being a patentee. Having in 1839 under my management the greatest number of steam vessels belonging to any one company, I was naturally desirous of economizing fuel; and having practically ascertained the efficiency of the argand principle (as above explained by Mr. Woodcock himself), I had no alternative but either myself going to the expense of a patent, or seeing others do so, as they soon assuredly would, and then probably have to pay for the use of my own invention, and for my own vessels. Having, then, taken out the patent, I disposed of my interest in it, and without a shilling of profit, and never since took any trouble about it.

For Mr. Woodcock's information, I can mention another similar case. In November, 1840, I took out, *and for the same reason*, a patent for the application of the *pin heat conductors*, for "increasing the heat-transmitting power of the interior plate surface of boilers." (See my treatise, chapter 17.) Since then, I confined myself to the use of these heat-conductors in the steam-vessels under my direction, and took no further interest in the patent. A few years will see these heat-conductors universally applied, although I have never realized a shilling by the patent.

Mr. Woodcock says:—"Mr. Williams thought it prudent to try the invention of others, to wit, Mr. Prideaux." Yes, certainly; I did *try* Prideaux's plan. I obtained, at a considerable expense, one of his self-acting valves; not, however, for use, but "*to try*" it, and proved that what is good in it, namely, the "introducing the air by separate films," was an unqualified imitation of my patent: and that what was really Mr. Prideaux's part, namely, the self-acting valve, was a worthless adjunct,—that, in fact, combustion was more effective, and more heat generated when the valve was inoperative, and *fixed*, so as to allow, *at all times*, a certain amount of air to enter to the gases (I beg pardon — to the "Parliamentary smoke"). These facts being proved, Mr. Prideaux's door was, of course removed.

Mr. Woodcock says:—"Mr. Prideaux's and my plans are not identical." I say they are identical, not in the useless adjuncts of Venetian blinds, &c., but in all that regards the introduction of the air "in *thin films* or *by numerous small apertures*," and on which the whole question of perfect combustion without smoke depends.

As to the use of *hot air*, that is the mere *ad captandum* element of the quackery. Until Mr. Woodcock or Mr. Prideaux can prove that bringing hot air to the gas in the argand burner improves the combustion and "burns the smoke," or that they can breathe more easily, and their lungs have a better action, when in the hot atmosphere of the oven, than in the open fields, their *hot air* (like his Parliamentary smoke) may pass for its *quantum valeat*, viz., *nil*.

I am, Sir, yours, &c.,

C. W. Williams.

Liverpool, Jan. 6, 1855.

ON LAUNCHING SHIPS.

To the Editor of the Mechanics' Magazine.

Sir,—I cannot but imagine that some *simple* and *sure* means of liberating a vessel from the position in which she has been built on the stocks, at a given moment, is a great desideratum.

The employment of a "dog-shore," having one extremity placed against the end

of a piece of timber, called a riband, extending the whole length of the ground-ways, and fastened to the ground-ways, and the other extremity against a large chock secured to the bilge-ways, upon each side of the ship, is attended with great disadvantages.

When it is required to launch the ship, a small piece of wood called a "trigger," used to keep the dog-shore in its proper position, is readily removed; the dog-shore is then acted upon by some impulsive force, such as a blow with a maul or with a pig of ballast; if the dog-shores thus struck fall away, all is well, but numerous instances might be cited in which all attempts to remove these shores by striking them have been useless: they have then to be *cut away*, a work of considerable time, leading at times to hair-breadth escapes of very serious accidents.

These and other difficulties have led to ships being launched without these shores. The ships being usually built at an inclination of $\frac{5}{8}$ of an inch to a foot, and launched at an inclination of $\frac{7}{8}$ of an inch to a foot, it is readily seen, that to move one foot horizontally the vessel must descend $\frac{7}{8}$ of an inch; to keep her from descending, a number of blocks are kept under, and not "split out," until it is required to launch her; to remove these blocks with such an immense weight upon them is a work of considerable difficulty, and these means being adopted, the launching cannot be ensured at any exact time. For several hours before the launching of the ship the shores which have supported her are gradually removed during this time; should there be a serious accident likely to occur from keeping her on the slip, it may be advisable to liberate her (and this without any impulsive force, which in itself might cause an accident), and let her glide off the ways.

Many *very simple* and yet *effective* means may be devised to accomplish the desired object; I think the following may be classed amongst them:—Let there be two iron plates, let one into the under side of bilge-ways, the other into the upper side of ground-ways; let a large bolt, having a thread cut on its uppermost end, pass through the bilge-ways, and also through the two iron plates; this, fitted on each side of the ship, would prevent the bilge-ways from moving over the ground-ways; let similar nuts be fitted on these two screws, having affixed to them small wheels so constructed, that a chain could not slide round them; pass a small chain round these two wheels; motion could not then be communicated to one nut without the other; let the bolts extend equal distances through the plates in the ground-ways; fit the nuts with wheels on "cross-spanners," so that two or four men may turn them and thus raise the bolts. At the word of command these wheels are turned, the bolts simultaneously raised, and the connection between the bilge-ways and ground-ways being thus destroyed, the ship is freed from her fetters. Persons unacquainted with the terms "bilge-ways" and "ground-ways," may see engravings and explanations of them in an article published in Vol. LX., page 461, of your Magazine.

I am, Sir, yours, &c.,

W. L.

Portsmouth.

ON ORDNANCE AND GUNPOWDER.

To the Editor of the Mechanics' Magazine.

Sir,—Will you kindly permit me to say a few words in reference to "T.'s" letter on gunpowder, published in your last? Some years ago, when percussion locks were first introduced among sportsmen, I happened to reside in a district where, during the winter, I had frequent opportunities of observing what was then said to be peculiar to the new lock, and was considered to be an unfavourable characteristic. When the snow was on the ground it was observed that, after a discharge of the piece, a portion of the powder would be seen on the snow before the muzzle of the piece, which, from its granular appearance, was supposed to be part of the charge unexploded. Some thought that this was owing to the vent being improperly placed in relation to the chamber; but whatever the cause may have been, if the fact be true, it is contrary to the theory of "T.," which supposes that the heat generated being greater than that of red-hot iron, is sufficient to insure complete combustion of the powder. One thing is obvious, however, that some other conditions are necessary beside the generation of heat. The oxy-hydrogen light apparatus may be taken as a familiar illustration of this fact. The mixture of two parts hydrogen and one oxygen is much more inflammable than gunpowder, and the heat generated by its combustion more intense; and yet a small piece of wire gauze interposed between the gasometer and the burner, renders it safe and prevents explosion. The other, and perhaps the more important part of "S.'s" letter, I can only for the present notice by saying, that I have observed the effect produced by a portion of air being between the ball and charge, or, as it is commonly phrased, the ball not being home, but have never supposed that

it in any way favoured the theory of instantaneous combustion.

I am, Sir, yours, &c.,

J. F.

THE RIFLE, AND EXPANDING RIFLE SHOT.

To the Editor of the Mechanics' Magazine.

SIR,—The following reply from Mr. S. Herbert to a question from Major Reed, in the House of Commons, appears in the *Times* of Saturday last: "As to the intention of the government for the future, he might state that it was resolved to arm the whole of the troops with the Minié rifle, and that they were being issued to them as fast as they could be supplied from the manufacturers." (Cheers.)

More than a year ago Lord Hardinge, Commander-in-Chief, reported to her Majesty the Queen that I am the original inventor of the elongated exploding rifle-shot. His Majesty the Emperor of the French, out of his private purse, presented Captain Minié with 20,000 francs for putting an iron cup or culôt into the hollow base of this shot; and Lord Raglan, as Master-General of the Ordnance, prevailed on the British government to give Mr. Pritchett, an intelligent London gunmaker, £1,000 for allowing my rifle-shot to remain as it was without the addition of the iron cup, and thus "letting well alone."

I am, Sir, yours, &c.,

J. NORTON.

Owen's Hotel, Liverpool, Dec. 23, 1854.

REMARKS ON A NEW STEAM GENERATOR BURNING PURE HYDROGEN.

(*Addressed by M. Jametel to M. Bontigny.*)

SIR,—I had ascertained, as well as yourself, that evaporation, especially that of water, might be considerably assisted by multiplying or increasing the surface in contact with the heat. I also knew that it was possible to increase the amount of heat transmitted by a metal by employing heating surfaces crossed by bars, immersed to a certain depth in fluids, exchanging their temperatures; in fact, beside the advantage of a greater mass of heating surface, the surface of fluid in contact with the latter (plates or bars also counting as heating surfaces) would be continually renewed by the simple circulation of the fluids themselves.

I first construct a cylindrical boiler with *two* hemispherical covers, the lower one immersed in a fire, the upper one in connection with a dome, furnished with the usual appendages of steam boilers.

This boiler is surrounded with a double case or jacket, in which the products of combustion circulate, and which products in ascending come in contact with cylindrical surfaces ending in the boiler, after having passed along the sides. The feed-water descends in a contrary direction, and comes in contact with the said bars, the heat of which increases in proportion as they approach the bottom, and being already in a state of vapour before it has arrived at this point, it becomes surcharged with heat, and yields a completely dry steam, which should then and there be taken. The products of combustion continuing their passage come in contact with metallic wire-cloth, which removes the last particles of heat from them.

The whole, boiler and casing, is placed in a furnace of masonry, but a space is left in which the air which feeds the combustion is heated as it comes in contact with the sides of the casing.

With respect to the combustion I should tell you, that the hydrogen comes in from underneath, and into the centre of a circular case furnished on the inside with wire-cloth, the upper cloth carrying a layer of amianthus, on the surface of which the hydrogen burns, the necessary air previously heated flowing in laterally thereto.—*Translated from Moniteur Industriel.*

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in water-mill machinery.* (A communication.) Patent dated June 17, 1854. (No. 1326.)

This machinery is composed of parts for taking up the motive power from the water in motion, and consists of two or more parallel endless chains carrying buckets or paddles.

HENRY, LOUIS AMBROISE, of Metz, France, engineer. *Certain improvements in constructing railroads.* Patent dated June 19, 1854. (No. 1327.)

The inventor describes a great variety of forms of rails applicable to the permanent way of common railways, contrived so as to dispense with the ordinary cast-iron chairs, wedges, and cross sleepers; and a system of railroad for common vehicles, consisting of flat iron rails fixed at a suitable distance or gauge.

MEARS, GEORGE, of the Bell Foundry, Whitechapel-road, Middlesex. *Improvements*

in machinery or apparatus for obtaining sound. Patent dated June 19, 1854. (No. 1330.)

The object of this invention is to obtain sound regulated so as to be produced at certain intervals by mechanical means, the invention being particularly applicable to the sea-coasts for alarum bells, &c.

WEBER, JOSEPH VALENTIN, of Orchard-street, St. Luke's, London, watchmaker. *Improvements applicable to chronometers and other mechanism requiring a steady spring power.* Patent dated June 19, 1854. (No. 1332.)

Claim.—Combining two mainsprings in such manner that the mainspring in immediate connection with the going works shall be maintained by the other at a uniform tension, during the whole time the machine is in operation.

OLIVER, JOSEPH, of Wapping, Middlesex, manufacturer. *An improved construction of signal lantern.* Patent dated June 19, 1854. (No. 1337.)

The Admiralty require vessels to hoist, when at anchor, a lamp which shall spread a light all round the horizon, and when under weigh, to throw a light forward only. To produce these effects by the use of one lantern, the inventor glazes the lantern all round, and fits it with a movable reflector or panel, which, when applied, will prevent the radiation of light at the back part of the lantern.

BOGUE, DAVID, of Fleet-street, London, publisher. *An improved apparatus for facilitating the attachment of adhesive stamps.* (A communication.) Patent dated June 19, 1854. (No. 1338.)

The stamps or labels when cut up are arranged in a pile and placed in a box, the sides of which are formed of four vertical plates hinged to a fixed bottom plate. These hinged plates are kept in a vertical position, by means of bow strings affixed to the bottom of the box, and their upper edges are bent over outwards, to permit of the sides of the box yielding when pressed upon vertically by the descent of the damped paper, which is to be brought down upon the upper stamp.

WORRALL, HENRY, of Staley-bridge, Chester, innkeeper. *Improvements in machinery or apparatus for carding cotton, wool, or other fibrous materials.* Patent dated June 20, 1854. (No. 1339.)

Claim.—The use of an endless creeper with lap drum, comprising rollers and carriers, for the purpose of making the lap of cotton or other fibrous substances.

BRUNTON, WILLIAM, of Camborne, Cornwall, civil engineer. *Certain improvements in metallic pistons.* Patent dated June 20, 1854. (No. 1340.)

This invention consists in a method of tightening up the piston rings whenever required, without the labour of taking off the cylinder cover and junk ring of the piston, at the same time securing equal pressure upon each spring or other power required to force out the piston rings during the process of tightening. In illustration of the nature of the invention, Mr. Brunton states that it may be effected by having a plug grooved to correspond in number with the spring in the piston, fitting into a hole in the centre of the piston. The bolts which are connected to the springs rest in these grooves; when the piston is first inserted they are placed in the deepest part of the groove, or bottom of inclined or wedge-like part. Through the plug a screw is inserted, having a conical collar, which is fitted and ground into the inside of the junk ring, a square head to the screw going through and extending some 1½ inches outside of the junk ring. In the centre of the cylinder cover is a hole large enough to insert a box spanner, which would fit the head of the screw extending out of the junk ring, into which hole a plug is inserted when the engine or other machine is at work. When the piston requires tightening up, the plug in the cylinder cover is taken out, and a box spanner inserted; and by unscrewing the screw which is in the plug in the centre of the piston, the plug is made to return inwards, and the bolts attached to the springs forced to a greater distance from the centre of the piston by the inclined grooves in the said plug, thus tightening up the springs.

REEVES, CHARLES, of Birmingham, Warwick, manufacturer, and WILLIAM WELLS, of Sutton Coldfield, Warwick, carpenter. *A new or improved method of manufacturing certain kinds of metallic tubes.* Patent dated June 20, 1854. (No. 1343.)

The inventors mount a pair of dies or plates, having tapering grooves round their edges, on axes placed eccentrically, in such manner that tapering tubes are produced by rolling the metal between the edges of these dies, on suitable mandrils.

DAY, JOSEPH, of Birmingham, Warwick, manufacturer. *An improvement or improvements in certain kinds of candlesticks.* Patent dated June 20, 1854. (No. 1344.)

In this invention a thumb-plate connected with another plate, and passing through a slot in the candlestick, serves to raise and lower the socket, and a spring, made of a piece of sheet steel, pressing against the inside of the candlestick, retains the socket in its place.

STEPHEN, ALEXANDER, of Kelvinhaugh, near Glasgow, Lanark, ship-builder, and ALEXANDER PIRNIE, of Kelvinhaugh, black-

smith. *Certain improvements in the application of materials for, and in the arrangement of and method of applying, apparatus to be used as templates, for ascertaining and marking the proper positions for the rivet and bolt-holes required in the plates, frames, and other pieces or portions of the materials used in the construction and manufacture of iron ships or vessels, boilers, tanks, masts, spars, and other similar articles.* Patent dated June 20, 1854. (No. 1345.)

This invention consists in the use "of open, open-woven, or closely-perforated flexible materials for the construction of templates, such as wire-cloth, hair-cloth, or cloth of other suitable material, or of perforated flexible sheets of zinc, copper, brass, or other metals or materials;" the texture of such cloth or sheets being such that the holes may be seen through it, and therefore accurately marked upon it.

CLAYTON, NATHANIEL, and JOSEPH SHUTTLEWORTH, agricultural engineers, of Stamp-end Iron-works, Lincoln. *Improvements in portable and fixed combined thrashing, shaking, and winnowing machines.* Patent dated June 20, 1854. (No. 1347.)

Claim. — Applying two blowing fans or blowers on the same axis, and dividing the lower riddle into two separate compartments, in such manner that the corn may be a second time dressed.

REEVES, ROBERT, of Bratton Westbury, Wilts. *Improvements in drills for drilling liquid manure.* Patent dated June 20, 1854. (No. 1349.)

These improvements consist in dispensing with the employment of rotating buckets or vessels, and depending on a flow of the manure through openings in the vessel containing the same, one to each funnel, the liquid manure being kept constantly stirred to insure the flowing out thereof.

CHITTENDEN, GEORGE R., of Wood-street, London. *Improvements in sewing-machines.* (A communication.) Patent dated June 20, 1854. (No. 1351.)

This invention consists of certain arrangements for folding bindings for the edges of hats and other articles, and for holding such bindings during the sewing action; also for folding the edges or selvages of fabrics for hemming, and introducing cords, when necessary, into the hems or folded edges.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *An improved manufacture of pigments or colouring matters.* (A communication.) Patent dated June 20, 1854. (No. 1353.)

Claim.—"The production of a siccative black, brown, or gray pigment or colouring matter, by the admixture with the gas tar or other organic substance to be carbonized for the purpose, of the oxides of potassium, sodium, calcium, aluminum, or other alkaline and earthy bases."

M'INNIS, JOHN, of Liverpool, Lancaster, oil-merchant. *An improved composition for coating the bottoms of iron ships to prevent their fouling, and other useful purposes.* Patent dated June 21, 1854. (No. 1356.)

This invention consists in the application of a metallic soap to the bottoms of ships, to prevent their fouling, by the adhesion of animal or vegetable matters, whether the metallic soap is mixed with other matter or not.

PHYSICK, HENRY VERNON, civil engineer, of North-bank, Regent's-park, London. *Electric telegraphs, and apparatus connected therewith.* Patent dated June 21, 1854. (No. 1357.)

Claims.—1. The use of more wires than one, plaited or twisted together as described, as a conductor for the electricity in submarine cables. 2. The use of spirals, &c., to distinguish the wires in a telegraph cable one from the other, and to distinguish one cable from another when several are laid together. 3. The use of cotton instead of hemp in making telegraph cables. 4. A certain described plan for preventing the slipping of wire supported on insulators, and means of fastening insulators to their supports.

DEMBINSKI, HENRY, General, of Rue Joubert, Paris, France. *Improvements in heating apparatus.* Patent dated June 21, 1854. (No. 1358.)

The inventor combines two vessels together by means of a pair of tubes; to one of these, called the heat-receiver, the heat of a gas-jet, lamp, or candle is applied, and the heated water flows through the upper of the tubes into the other vessel, &c.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improvements in apparatus for generating and utilizing steam.* (A communication.) Patent dated June 21, 1854. (No. 1361.)

The main object of this invention is to apply steam to fire engines, for which purpose the patentee proposes "to increase the capacity of the boiler from the fire to the steam-receiver, and this constitutes the gist of the invention." The boiler is formed by "dividing a coil or coils commencing with one, then dividing into two, and then subdividing into four, or any other number," the water being received at the bottom, and the streams multiplied, or the capacity increased, as they ascend.

RHODES, THOMAS, of Vine-street, America-square, London, merchant. *An improved method of framing school-slates.* (A communication.) Patent dated June 21, 1854. (No. 1362.)

The inventor makes the slate frame of

two pieces of wood, or other suitable material, with rounded corners, and a groove to receive the slate, the parts being fastened together by pins, glue, or composition.

STABLEFORD, WILLIAM, of the Bromsgrove Railway Carriage-works, Worcester, foreman to Messrs. Johnson and Kinder, railway contractors. *Improvements in railway breaks.* Patent dated June 21, 1854. (No. 1363.)

The inventor claims—1. The construction of a break caused to act upon the wheels by means of wedges. 2. A construction of breaks by which the weight of the carriage is caused to act upon them. 3. The construction of a double-acting break, which is caused to bite upon both sides of the wheel.

HEATHER, JOHN FRY, M.A., mathematical master at the Royal Military Academy, Woolwich. *Improvements in apparatus for regulating the flow of gas.* Patent dated June 21, 1854. (No. 1365.)

The inventor provides an outer vessel containing fluid, into which the gas enters by a vertical pipe, which rises above the surface of the fluid; there are also two air-tubes or passages fixed vertically to the bottom of the vessel, and these also rise above the fluid. Within the outer vessel there is a hollow float, the lower end of which is at all times immersed in the fluid, and is air-tight in all directions, but the upper part of the float has two hollow chambers, which are air-tight only at the top and sides, and into these chambers the air-passages before mentioned enter, so that the air in these chambers, and the outer atmosphere are at the same pressure. The float carries a conical or other valve for regulating the quantity of gas which is allowed to rise up the supply-pipe.

SIMPSON, GEORGE, of Union-buildings, Leather-lane, Holborn. *Improvements in furnaces.* Patent dated June 22, 1854. (No. 1368.)

The inventor employs hanging bridges or stops, in such manner as to have an extent of bright fire beyond them.

BLASHFIELD, JOHN MARRIOTT, of Millwall, Poplar, Middlesex. *Improvements in the manufacture of china, pottery, bricks, and other articles manufactured for the most part of clay.* Patent dated June 22, 1854. (No. 1369.)

Claim.—"The use of minerals or fossils containing phosphate of lime, and known in commerce as 'coprolites,' 'phosphorites,' 'fossil sponges,' 'fossil faces,' 'fossil flesh,' and 'fossil bones' in the manufacture of china, pottery, bricks, and other articles of which clay is the principal ingredient."

COWPER, CHARLES, of Southampton-buildings, Middlesex. *Improvements in machinery for combing cotton, wool, flax, tow, silk waste, and other fibrous substances.* (A communication.) Patent dated June 22, 1854. (No. 1371.)

This invention consists in certain modifications of a former invention, patented by the present patentee, February 23, 1852.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain new and useful improvements in machinery for forging or hammering iron, which may be also applicable to the hammering of other materials.* (A communication.) Patent dated June 22, 1854. (No. 1372.)

Claims.—1. A machine for forging or hammering iron, &c., having two hammers, which simultaneously strike the sides of the iron, acting in conjunction with a hammer which strikes the upper surface of the iron. 2. The use of the side hammers, either with or without the upper.

SMITH, EPHRAIM, of Carlisle-street, Middlesex, jeweller and watch-key maker. *An improved watch-key.* Patent dated June 22, 1854. (No. 1373.)

This invention is an improvement upon Bregnet keys, and consists in enabling keys to turn either from left to right or *vice versâ*, by means of a reversible paul or catch.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in grate-bars, and certain appliances to the same, for the purpose of preventing them from warping or twisting by heat.* (A communication.) Patent dated June 22, 1854. (No. 1374.)

This invention consists in casting or otherwise securing to the undersides of grate-bars, hooks or catches, through which one or more transverse bars are inserted, the transverse bars serving to hold every bar of the grate in its place, while each one is allowed to expand and contract independently of the others.

PRICE, ASTLEY PASTON, of Margate, Kent, chemist. *Improvements in the treatment of certain alloys of tin.* Patent dated June 22, 1854. (No. 1376.)

This invention mainly consists in subjecting certain alloys of tin and gold—such as that known as Australian auriferous tin—to the action of hydrochloric acid, so as to dissolve the whole or the greater proportion of the tin, the solution of chloride of tin being, by evaporation and crystalization, rendered suitable to be employed in the arts or otherwise.

PRICE, ASTLEY PASTON, of Margate, Kent, chemist. *Improvements in the purification of tin, and in obtaining useful products arising from such purification.* Patent dated June 22, 1854. (No. 1377.)

These improvements consist "in subject-

ing impure tin to the action of hydrochloric acid, and in decomposing the solution of chloride of tin so obtained by means of ammoniacal gas liquor, or other ammoniacal liquor, or with the volatile alkaline ammoniacal products obtained therefrom, or with ammonia or carbonate of ammonia, so as to precipitate the tin existing in solution, and to obtain a valuable product, muriate of ammonia."

FARRELL, ISAAC, of Dublin, Ireland, architect. *Improvements in fire-proof flooring and roofing, which improvements are also applicable to the construction of walls and bridges, and other like structures.* Patent dated June 22, 1854. (No. 1379.)

Claim.—The application and use of a tile, having a button or flange, either formed on or attached to it, and projecting from one side, or from both sides of it, if found necessary.

PHILLIPS, CHARLES, of Offchurch, Warwick, engineer. *The improvement of apparatus or machinery for reaping.* Patent dated June 23, 1854. (No. 1380.)

The inventor employs bars, cords, chains, or other suitable instruments, for inclining the corn into a suitable position for being cut; these, by revolving round two or more axles, being caused to act on the corn over a larger space than they would by revolving round a single axle; and he combines these with rotating circular cutters, against which the corn is supported by projections from the machine.

KNAB, DAVID CLOVIS, of Rue Rosini, Paris, France, operative chemist. *Certain improvements in the production of carburets of hydrogen.* Patent dated June 23, 1854. (No. 1381.)

The inventor says, "I operate upon coal, turpentine, cannels, lignites, and bituminous matters, in a still similar to that described in former letters patent granted to me, and heat them to a temperature of about 400° to 600° centigrade, which temperature should be constantly, or nearly constantly, kept up, by means of a metallic bath, also described in former letters patent granted to me." The products of these operations upon coal are light oils and essences, which are submitted to rectification.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *An improvement in propelling vessels in water.* (A communication.) Patent dated June 23, 1854. (No. 1383.)

Claim.—The employment for propelling vessels of any number of propellers, having each a movement towards and from the side of the vessel, and a reciprocatory circular movement about an axis.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in machinery for picking or opening cotton and other fibrous materials, and all kinds of waste rags and old materials, to prepare the same for the operation of carding, or for other operations.* (A communication.) Patent dated June 23, 1854. (No. 1385.)

This invention principally consists in constructing the main cylinders of machinery for picking and opening cotton or other fibrous materials, &c., with perforations in their shells, through which currents of air are driven by fans or wings placed within the cylinder.

RUDD, THOMAS, of Pimlico, engineer. *Improvements in stands for casks or barrels.* Patent dated June 23, 1854. (No. 1386.)

Claim. "Forming a cask or barrel-stand actuated continuously through the intervention of a metallic spring or springs by the drawing off of the liquor, so as to give the cask or barrel the requisite self-tilting action forwards."

DIMSDALE, THOMAS ISAAC, of Hadley, Middlesex, gentleman. *An improvement in the manufacture of gas for lighting and heating purposes.* Patent dated June 23, 1854. (No. 1389.)

Claim. The method of operating upon carbonaceous or bituminous substances by the introduction into the retort during the process of distillation of jets of superheated steam, for the purpose of decomposing the same, and causing its elements to combine in a nascent state with the gases evolved from the carbonaceous or bituminous substances contained in such retort. Also mixing with solid carbonaceous matters fatty, oleaginous, or resinous substances previous to the same being placed in the retorts for the production of gas.

OSBORN, WILLIAM ELLSWORTH, of Milton, New York, United States. *Improvements in breech-loading guns or cannons.* Patent dated June 23, 1854. (No. 1390.)

The inventor employs an eccentric or cam-shaped piece set on trunnions, "so that the operation of rotating the said breech-piece on its trunnions by a lever or any suitable means, compresses the curved surface of the said breech-piece against the rear of the bore or calibre of the gun."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

FELL, THOMAS MARA, of King William-street, London, and WILLIAM COOKE, of Curzon-street, Hanover-square, Middlesex. *Improvements in bottles and bottle-stoppers, and in stopping and applying the same.* Application dated June 19, 1854. (No. 1328.)

This invention consists in so manufacturing bottles and stoppers for them, that it

is necessary to remove the latter only when the former are to be filled.

ANDERSON, SIR JAMES CALEB, of Fermoy, Cork, baronet. *An economical railway for the conveyance of passengers, goods, and letters.* Application dated June 19, 1854. (No. 1329.)

In carrying out this invention, after the rails are fixed, they are to be enclosed in a chamber; and to work the line, the inventor "fixes high-pressure engines at such distances as may be found requisite. On the top of the chamber which encloses the rails, the chimneys of the engines are to be placed. The exit steam of each engine is to be permitted to escape at a good pressure into its chimney. By this arrangement the air in the chamber will be drawn up the chimney, and thus a strong current of air will be caused to rush into the chamber at the opposite end to that at which the engine is at work, and in the direction of the working engine."

WESTLAKE, JOHN, of Newton Abbott, Devon, mine agent. *Improvements in treating the pulverized solution obtained from machines used for crushing ores, gossans, earths, and rocks.* Application dated June 19, 1854. (No. 1331.)

This invention consists in drawing off the "pulverized solution" into a vessel, separate from the crushing-machine, and having a fire at the bottom, and provided with a revolving apparatus, by which the solution is brought in contact with mercury.

BAUER, WILLIAM, of Munich, Bavaria, engineer. *Improvements in propelling vessels.* Application dated June 19, 1854. (No. 1333.)

This invention consists in driving screws, paddle-wheels, or other propellers, with fans or rotating sails, connected with their shafts by suitable mechanism.

DARTIGUENAVE, PROSPER GUILHAUME, of Regent-street, Middlesex, gentleman. *Improvements in aërial navigation.* Application dated June 19, 1854. (No. 1334.)

The inventor employs an apparatus similar to two parachutes, which rise on being pushed up and down, and are steered and turned by means of a horizontal flapper and a pair of wings.

SCHLESSINGER, JOSEPH WILLIAM, of London-wall, London, merchant. *A means of readily discovering any street, road, river, locality, or place, on maps, charts, and plans.* (A communication.) Application dated June 19, 1854. (No. 1335.)

This invention consists in combining with a numbered or figured margin to maps, charts, and plans, a tape or other measure, with numerals on its surface.

RILEY, SAMUEL, of Oldham, Lancaster, agent. *Certain improvements in pocket-books, bill-cases, or other such depositaries.* Application dated June 19, 1854. (No. 1336.)

This invention consists principally in the application of elastic springs or bands to the interior of pocket-books, bill-cases, &c., for the purpose of securing or retaining notes, loose papers, &c., in the pockets thereof.

ACLAND, JAMES, of Langley-cottage, South Lambeth, Surrey, Parliamentary agent. *Improvements in the manufacture of paper.* Application dated June 20, 1854. (No. 1341.)

This invention consists in forming paper of the fibrous portions of the roots of potatoes, parsnips, carrots, and turnips, and of the roots, stems, and stalks of beet, mangold wurzel, chicory, and rhubarb, either alone or mixed with rag pulp.

HOLT, THOMAS LITTLETON, of Warwick-square, Paternoster-row, London, and WILLIAM CHARLTON FOSTER, of Hatton-garden, Middlesex. *Making paper.* Application dated June 20, 1854. (No. 1342.)

The inventors take clover, hop-stem, Italian rye, grass, and old rope, or rags, in equal proportions, "or all or either of them individually, or in combination with each other, or with old rope or rags, as aforesaid," and make the whole into pulp in a common beating engine.

JESSON, JEAN EUGÉNE, clockmaker, of Paris, France. *An improved barometer, called "hydrographer barometer."* Application dated June 20, 1854. (No. 1346.)

The inventor employs a strip of bladder, or of gold-beater's skin, which is fixed at one end and passed round pullies so as to obtain a considerable length of the ribbon in a small space. The other end of the strip is attached to the shorter arm of a lever, and a thread from its longer arm is passed round a groove or small pulley on the spindle of a registering index. The strip is kept extended by means of a weight or spring.

MONZANI, WILLOUGHBY THEOBALD, of St. James's-terrace, Bermondsey, Surrey, gentleman. *An improvement in brushes and brooms.* Application dated June 20, 1854. (No. 1348.)

This invention consists in the application of vulcanized India-rubber or other elastic material on those parts of brushes and brooms which are liable to be struck against skirtings, &c.

BRAITHWAITE, FREDERICK, of Gower-street, Bedford-square, Middlesex, civil engineer. *Improvements in constructing suspension bridges, roofs, and coverings.* Application dated June 20, 1854. (No. 1350.)

This invention consists in the application "of wire-rope, hemp, flax, or cotton ropes, canvas or other textile material, iron chains, and iron links or bars of whatever length,

to the construction of suspension bridges, roofs, and coverings."

McLaine, Alexander, junior, of Belfast, Ireland, shipbuilder. *An improved mode of constructing and fitting gun-boats.* Application dated June 20, 1854. (No. 1352.)

Gun-boats constructed according to this invention are made of iron, are sharp, have rudders at each end, and have very little side exposed above the water. In the middle of the upper deck, which is of iron, a cannon of large calibre is mounted in fixed bearings, held down by bolts, which pass through the angle iron of the fore and aft bulk heads.

Byerley, George Henry, of Paris, France, now residing at Brompton, Middlesex, gentleman. *Improvements in machinery for the manufacture of bricks, tiles, quarries, tubes, and other such like articles.* Application dated June 20, 1854. (No. 1354.)

The inventor, by means of certain machinery, manufactures hollow bricks, tiles, tubes, pipes, &c., from clay or brick earth, in a dry or partially dry state, reduced to powder, and intimately mixed with sand, ashes, or whatever substance it may be deemed needful to employ by means of pressure.

Donald, William, and William Heginbotham, power-loom managers for John Ferguson and Co., both of Carlisle, Cumberland. *Certain improvements in looms.* Application dated June 21, 1854. (No. 1355.)

This invention has reference to a certain arrangement of apparatus whereby the weights, ropes, and levers ordinarily employed in weaving looms for producing the necessary friction to the force-beam are dispensed with.

Shaw, James Whitworth, of Birmingham, Warwick, merchant. *Improvements in apparatus or machinery for producing motive power.* (A communication.) Application dated June 21, 1854. (No. 1360.)

This invention consists "in a certain arrangement and combination of an axle with a system of shifting radial arms or levers furnished with weights, and maintaining a motive power by the force of gravity alone without any other agent than mechanism."

Parsons, William, of Paradise-street, Lambeth, Surrey, engineer. *Improvements in rotatory engines.* Application dated June 26, 1854. (No. 1364.)

This invention consists in employing a moveable cylinder in such manner that when the engine is at work, the cylinder may constantly change its position, and be eccentric to its axis, which retains a stationary position, but rotates within the cylinder, "and in such manner that the piston which is fixed to the axis will be pressed on and moved continuously by the same steam."

Stidolph, William, machinist, of Wintoun-place, Greenwich, Kent. *A transferable book marker.* Application dated June 22, 1854. (No. 1366.)

The inventor bends a narrow strip of metal or other elastic material double, so as to form a spring, which is intended to clasp the cover, back, or leaves of a book; and at the bend of this spring attaches one or more ribbons or strings, which are used as marks between the leaves. He sometimes elongates one blade of the spring, which may be then used as a paper knife.

Yates, Thomas Chadwick, of Bolton-le-Moors, Lancaster, cabinet maker. *Improvements in wickets for the game of cricket.* Application dated June 22, 1854. (No. 1367.)

This invention consists in connecting the three stumps, forming part of the wicket, to a stand by means of springs of vulcanized India rubber, or other suitable material, so that after the stumps are struck, by the cricket ball or otherwise, they resume their perpendicular positions.

Brown, William Henry, of Wardsend Steel Works, near Sheffield, York, steel roller and manufacturer. *An improvement in the construction of furnaces for the melting of steel and other metals requiring a crucible in the melting thereof.* Application dated June 22, 1854. (No. 1370.)

The inventor employs a portable furnace, coated with a substance capable of resisting intense heat, and suspended by axes in its sides upon a carriage running on wheels or rollers. This furnace is to receive the crucible, and, along with its carriage, is to be drawn out from under the flues or stack, the melted metal being poured therefrom into the ingot moulds, by the entire furnace (crucible included) being tilted by means of a pulley or block.

Logan, George Fox, of Glasgow, Lanark, boiler maker. *Improvements in portable winches.* Application dated June 22, 1854. (No. 1375.)

This invention consists of an arrangement for increasing the adaptability of the ordinary crab, or similar winches.

Ermen, Godfrey, of Manchester, Lancaster, cotton spinner. *Certain improvements in machinery or apparatus for winding yarns or threads.* Application dated June 22, 1854. (No. 1378.)

In this invention the yarn or thread is wound on to the cards by means of "flyers," which are set in motion by small wheels, such wheels and "flyers" being regulated by other gearing, which stays their motion after any given length of yarn is wound on. By this arrangement the inventor is enabled, he says, "to wind either one single card or a number of cards or suitable substitutes at the same time."

De Fontainemoreau, Peter Armand Lecomte, of South-street, London. *Improvements in machinery for the manufacture of nails.* (A communication.) Application dated June 23, 1854. (No. 1382.)

The machinery described by the inventor consists of two cylinders, in the lower of which a groove is made, each of the three internal sides of which groove has the form of one side of a nail; "the three sides being united, present the form of the three sides of a nail, and the groove being divided into six parts, affords the space for six nails."

Dreyfus-Werth, Salomon, and Pierre Meunier, of Sainte Marie-aux-Mines (Haut Rhin), France. *A new or improved system of applying designs to all kinds of fabrics, and of surfaces of wood, marble, and stone.* Application dated June 23, 1854. (No. 1384.)

Fabrics or other substances, after being subjected to one or more baths for rendering them sensitive, are well washed and dried. The designs to be reproduced on the surface are then laid on it in a suitable manner, and the whole or part of the surface thus treated is exposed to the action of solar light during a few moments. The surface, having thus received the image or outline of the design, may have any required tint given to it by the usual processes.

Weild, John, of Glasgow, Lanark, marine surveyor. *Improvements in preventing the drainage waste of cargoes on shipboard.* Application dated June 23, 1854. (No. 1387.)

This invention "is carried into practical effect by caulking, or otherwise rendering perfectly tight the lining or ceiling of the ship, so as to prevent leaked matter from mixing with the bilge water. Or the same thing may be effected by arranging tanks or other receptacles for the drainage matter to flow into."

Keyse, John, of Apollo-buildings, Walworth, Surrey, gentleman. *An improved method of loading muskets, rifles, carbines, pistols, and all descriptions of small arms, with cartridge, without applying the cartridge to the mouth.* Application dated June 23, 1854. (No. 1388.)

This invention consists in "making grooves round the top and the outside of the barrel of the small-arm, and round the top and outside of the socket of the bayonet or sword to be attached to the small-arm," so that by placing the top or end of the cartridge on the top and outside of the barrel of the piece, the end of the cartridge may be removable by hand.

Lightbown, Henry, of Pendleton, Lancaster, paper stainer. *Improvements in drying pulp in the manufacture of paper, also paper-hangings and printed textile fabrics.* Application dated June 24, 1854. (No. 1393.)

This improvement consists in causing the materials to be dried to pass over plates, or through chambers, heated by a number of jets of gas.

PROVISIONAL PROTECTIONS.

Dated October 6, 1854.

2149. Andrew Smith, of Princes-street, Middlesex, civil engineer. An improved safety-cage and apparatus for miners.

Dated December 16, 1854.

2647. Daniel Chandler Hewitt, of Richmond, Surrey, professor of music. Improvements in the construction of pianofortes.

2649. John Sykes, of Huddersfield, York, machine-maker. Improvements in piecing-machines, a part of which improvements are applicable to other similar purposes.

2651. Thomas Forshaw, of Manchester, Lancaster, calenderer. Improvements in machinery or apparatus for beetling woven fabrics.

2653. James Fenton, of Low Moor, York, civil engineer. Improvements in the manufacture of axles, pistons, rods, and shafts, girders, and other like articles.

2655. Robert Lucas Chance, of Birmingham. An improvement in the manufacture of glass.

2657. Juliana Martin, of Soho-square, London. A safety-apparatus for effectually cleaning windows from the inside of a room.

Dated December 18, 1854.

2659. Maria Morrison, of Chelsea, Middlesex. A mode of preserving inscriptions and paintings on glass, applicable for monumental and other tablets.

2663. Robert Von Seckendorff, of St. Helen's, Lancaster, manufacturing chemist. Improvements in concentrating and distilling sulphuric acid.

2665. Thomas Hart, of George-street, Glasgow, foreman to Messrs. David and John Anderson, manufacturers. Improvements in Jacquard apparatus for weaving.

2667. James Cunningham, of West Arthurlie, Renfrew, North Britain, bleacher. Improvements in starching textile fabrics.

2669. James Pritchard, of Portsea, Hampshire. Certain improvements in the construction of screw propellers.

Dated October 19, 1854.

2670. Auguste François Joseph Favrel, of Paris, gold-beater. A new machine for beating precious metals, applicable to leather and to forging.

2672. Jean Baptiste Falguière, engineer, of Marseille, French Empire. Certain improvements in apparatus and machinery for propelling boats and vessels on water.

2673. John Avery, of Essex-street, Middlesex. Improvements in machinery for cutting metallic bars. A communication from Samuel Hall, of New York, United States of America.

2674. Frederick Robert Augustus Glover, of Bury-street, Westminster, M.A. Improvements in or applicable to the construction of carriages.

2675. Joseph Gorton Briggs, of Kingsland, Middlesex, gentleman. Improvements in the manufacture of fuel.

2676. James Langridge and Richard Langridge, of Bristol. Improvements in stays or corsets.

2677. Joseph Tucker, of Guinea-street, Bristol,

ship-builder. An improvement in the construction of ships for saving persons in case of shipwreck.

2678. Joseph Quick, of Sumner-street, Southwark, civil engineer. Improvements in the construction of furnaces.

Dated December 20, 1854.

2679. William Bittleston, senior, of Mary-street, Middlesex, architectural and engineering draughtsman. Improvements in ploughs.

2680. R. B. Huygens, of Holland. Improvements in ordnance and fire-arms, and in the projectiles to be used therewith.

2681 John Paul, of Manchester, Lancaster, paper-stainer. Improvements in machinery or apparatus for colouring or staining the surfaces of paper, leather, woven fabrics, and similar materials.

2682. John Higgins, of Oldham, Lancaster, engineer. Improvements in steam boilers, and apparatus connected therewith, parts of which improvements are applicable to valves and steam indicators.

2684. William Milner, of Liverpool, Lancaster, fireproof-safe manufacturer. Improvements in safes, and other such depositories, and further improvements in the locks of the same.

2685. Alexander Cochrane, of Kirkton Bleach Works, Renfrew, North Britain, bleacher. Improvements in starching textile fabrics.

2686. Richard Whytock, of Edinburgh, and Thomas Preston, of Nottingham. An improvement in the manufacture of fabrics by twist-lace machinery.

2687. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton. Improvements in machinery for splitting leather. A communication.

2688. Robert Walker, of Glasgow, merchant. Improvements in telegraphing.

Dated December 21, 1854.

2689. Thomas and Samuel Baker, of Liverpool, Lancaster, engineers. Improvements in the mode or method of lifting or lowering weights or heavy bodies by steam or hand power.

2690. John Venables and Arthur Mann, of Burslem, Stafford, earthenware manufacturers. Printing and fixing self and other colours in china, earthenware, parian, gypsum, stoneware, bricks, blocks, bats, slabs, tiles, quarries, glass, metals, hardware, gums and gummeous substances, and papier-maché ware.

2691. George Bell, of Cannon-street West, London, and George Charles Grimes, of Wandsworth, Surrey. Improvements in the manufacture of lucifer or congreve matches, and other instantaneous lights.

2692. William Bertram, of Upper Harden-street, Woolwich, Kent. Improvements in the manufacture of iron ships, steam and other boilers, bridges, and other structures where numerous sheets of iron are used.

2693. William Greener, of Birmingham, Warwick, gun-maker. Improvements in repeating military rifles, carbines, and pistols, and in cartridges to be used therewith.

2694. Henry Render, of Liverpool, Lancaster, gentleman. Improvements in the manufacture of night-lights.

2696. Gustave Irenée Sculfort, manufacturer, of Maubeuge, French Empire. Certain improvements in manufacturing screw-plates.

2697. Jabez Smith, of Bedford, silk-mercer. An improved buckle or fastening.

2698. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of railway and other wheels. A communication from Hippolite Ullysse Petin and Jean Marie Gaudet, of Rive de Gier, France, manufacturers.

2699. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the application of the electrotype or galvano-plastic processes. A communication from Etienne Lenoir, of Paris, France, galvanizer.

Dated December 22, 1854.

2700. Louis Joseph Frédéric Margueritte, chemist, of Paris, France. Improvements in the manufacture of sulphuric acid.

2702. John Hunt, of Birmingham, Warwick, brass-founder. An improvement or improvements in illumination.

2704. Robert Ashworth, of Rochdale, Lancaster, engineer, and Samuel Stott, cotton-spinner, also of Rochdale, Lancaster. Improvements in machinery for preparing, spinning, and doubling fibrous substances.

2706. Edward Loysel, of Rue de Gretry, Paris, France, civil engineer. An improved apparatus for cooking or preparing edible substances.

2708. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in electro-magnetic engines. A communication from Thomas C. Avery, of New York, United States of America.

2710. Felix Marie Baudouin, of Paris, France. Improved means of isolating and testing the isolation of the wires of electric telegraphs.

Dated December 23, 1854.

2712. Barthélemy Martin Giroux, of Liege, Belgium, locksmith and mechanician. Improvements in the construction of locks.

2714. John Francis Porter, of Besborough-street, Middlesex, civil engineer. Improvements in the manufacture of bricks and tiles.

2716. John McKelvey, of Belfast, Antrim, Ireland. Certain improvements applicable to spinning, twisting, and roving or slubbing flax and other fibrous substances.

2718. Charles Henfrey, of Turin, Sardinia, civil engineer. Improvements in the construction of railways for steep gradients, and in the machinery or apparatus employed therein or connected therewith. A communication from Signor Pasquale Delorenzi, of Turin, Sardinia.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

2764. Samuel Smith Shipley, of Stoke Newington, Middlesex. Improvements in fittings suitable for dressing-cases, and for other purposes of elegance and utility. December 30, 1854.

1. Epaminonda Frascara, of Alessandria, Piedmont, now of Alfred place, Bedford square. A voltaic pile, and of the application of its electric fluid either to the decomposition of water, or to enable tho gases to r place the steam power actually in use. January 1, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 9th,* 1855.)

1889. Thomas McNally. Improvements applicable to window-sashes or shutters.

1905. Julian Bernard. Improvements in the manufacture of combs.

1908. John Macmillan Dunlop. Improvements in machinery or apparatus for preparing, cleaning, and cutting India-rubber and gutta percha. Partly a communication.

1914. James Danks. An improvement or im-

provements in inkstands, which improvement or improvements may also be applied to the stoppers of bottles, the packing of pistons, and other like purposes.

1919. Henry Bernoulli Barlow. Improvements in machinery for cleaning cotton and other fibrous materials. A communication.

1927. James Parker. An improvement or improvements in the smoke-boxes of locomotive engines.

1942. John Henry Pape. Improvements in wind musical instruments.

1951. Paul Adolphe Garnaud. Improvements in certain gazogene apparatus used for the production of aërated liquids.

1970. Achille Guyardin. The use of a certain fibrous matter for the manufacture of paper and pasteboard.

1990. Auguste Edouard Loradoux Bellford. Improvements in electro-magnetic clocks. A communication.

1999. Alfred Wilson and George Wilson. Improvements in knitting machinery.

2070. Thomas Clayton and Robert Harrop. Improvements in ornamenting wood, and in the machinery or apparatus connected therewith.

2089. Charles William Lancaster. Improvements in fire-arms and in cartridges to be used therewith.

2091. Louis Beer. Certain improvements in machinery for shearing piled terry or raised fabrics.

2121. Alfred Vincent Newton. Improvements in motive-power engines, applicable to the working of their valves, and to the conversion of the reciprocating motion of such engines into rotary motion. A communication.

2180. Edward John Seville. An improvement in the manufacture of hats. A communication.

2265. John Henry Pape. Improvements in the manufacture of boots and shoes.

2390. Eugène Antoine Lépine. Certain powders and collyrium for curing the diseases of the eye, without the use of surgical operations, to which invention he has given the name of "Lépine's Ophthalmological Powders and Collyrium."

2442. George Tomlinson Bousfield. Improvements in preventing incrustation in steam boilers. A communication.

2471. William Aristides Vérel. Improvements in grinding or pulverizing bones.

2503. Thomas Restell. Improvements in umbrellas, parasols, and cases or covers, and walking-sticks.

2530. Thomas Restell. Improvements in guns.

2577. Thomas Metcalfe. An improved construction of bath chair.

2617. John Nesmith. The manufacture of wire netting and wire fence by power.

2624. Samuel Fisher. Certain improvements in ordnance, and in machinery and apparatus to be employed in manufacturing the same.

2627. Thomas Haimes. Improvements in warp machinery.

2630. James Redgate, James Thornton, and Edwin Ellis. Improvements in machinery for the manufacture of lace and other fabrics.

2663. Robert Von Seckendorff. Improvements in concentrating and distilling sulphuric acid.

2672. Jean Baptiste Falguière. Certain improvements in apparatus and machinery for propelling boats and vessels on water.

2678. Joseph Quick. Improvements in the construction of furnaces.

2685. Alexander Cochrane. Improvements in starching textile fabrics.

2686. Richard Whytock and Thomas Preston. An improvement in the manufacture of fabrics by twist lace machinery.

2688. Robert Walker. Improvements in telegraphing.

2698. John Henry Johnson. Improvements in the manufacture of railway and other wheels. A communication from Hippolite Ulysse Petin and Jean Marie Gaudet, of Rive de Gier, France, manufacturers.

2708. John Henry Johnson. Improvements in electro-magnetic engines. A communication from Thomas C. Avery, of New York, United States of America.

1. Epaminonda Frascara. A voltaic pile, and of the application of its elastic fluid either to the decomposition of water, or to enable the gases to replace the steam power actually in use.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty - one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

NOTICE OF APPLICATION FOR LEAVE TO ENTER DISCLAIMER.

An application has been made to Her Majesty's Attorney-general by Charlotte Smith, wife of Jabez Smith, of Bedford, for leave to enter a disclaimer for the purpose of disclaiming a certain part of the specification of a patent granted to her, 14th May, 1849, for "improvements in certain articles of wearing apparel."

WEEKLY LIST OF PATENTS.

Sealed January 5, 1855.

1499. Joseph Ellisdon.
1521. William Houghton and Robert Hoyle.
1591. Richard Roberts.
1631. Alfred Vincent Newton.
1841. William Johnson.
1917. George Lewis.
2227. Peter Armand Lecomte de Fontainemoreau.
2327. Charles Hargrove.
2357. Thomas Metcalfe.
2383. Frederick Smith.

Sealed January 8, 1855.

1502. William Robertson and Robert Crighton.
1506. Felix Lieven Bauwens.

Sealed January 9, 1855.

1517. Thomas Richards Harding.
1536. Arthur James Lane.
1538. John Greenwood and Robert Smith.
1540. Edwin Travis.
1546. William Bishop.
1552. Astley Paston Price.
1622. John Henry Johnson.
1654. François Desiré Molvé and Pierre Martin.
1720. John Cunningham.
1730. Samuel Lucas.
1746. Jean Baptiste Ambroise Marcelin Jobard.

1978. John Norton.
2370. Edme Augustin Chameroy.
2384. George Ross.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

M. J. Baumhauer, author of the "*Mystère du Système Planétaire Dévoilé*," writes from Brussels in refutation of Mr. Mushet's remarks upon the Rotation of the Moon; but we do not intend re-opening that question at present. He offers to send an article, "*Sur d'autres erreurs enseignées par l'astronomie d'aujourd'hui*," which we shall be glad to receive.

F. E. W. wishes to know if any of our correspondents can inform him why Perkins's steam gun is now capable of throwing no more than 60 balls per minute, seeing that, thirty years ago, it was represented by scientific journals, on the authority of the late Mr. Perkins, to be capable of projecting upwards of 400 in that time. "F. E. W." also states that Mr. Perkins was then convinced that a steam engine might be made to throw a ball of a ton weight from Dover to Calais.

J. Thomlinson.—You must send us the date of the patent you refer to, as well as the number, before we can answer your first question. The *Law Times* will probably furnish you with the report you refer to; we do not know how else you can obtain it.

A. F.—It will not be possible for you to complete your studies as a civil engineer unless you put yourself in communication with some gentleman of that profession. The acquirements you say you possess afford an admirable basis for the knowledge you will have to gain. If you please, we will furnish you with a list of books you would do well to study.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166 Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co, Dublin; W. C. Campbell and Co., Hamburg.

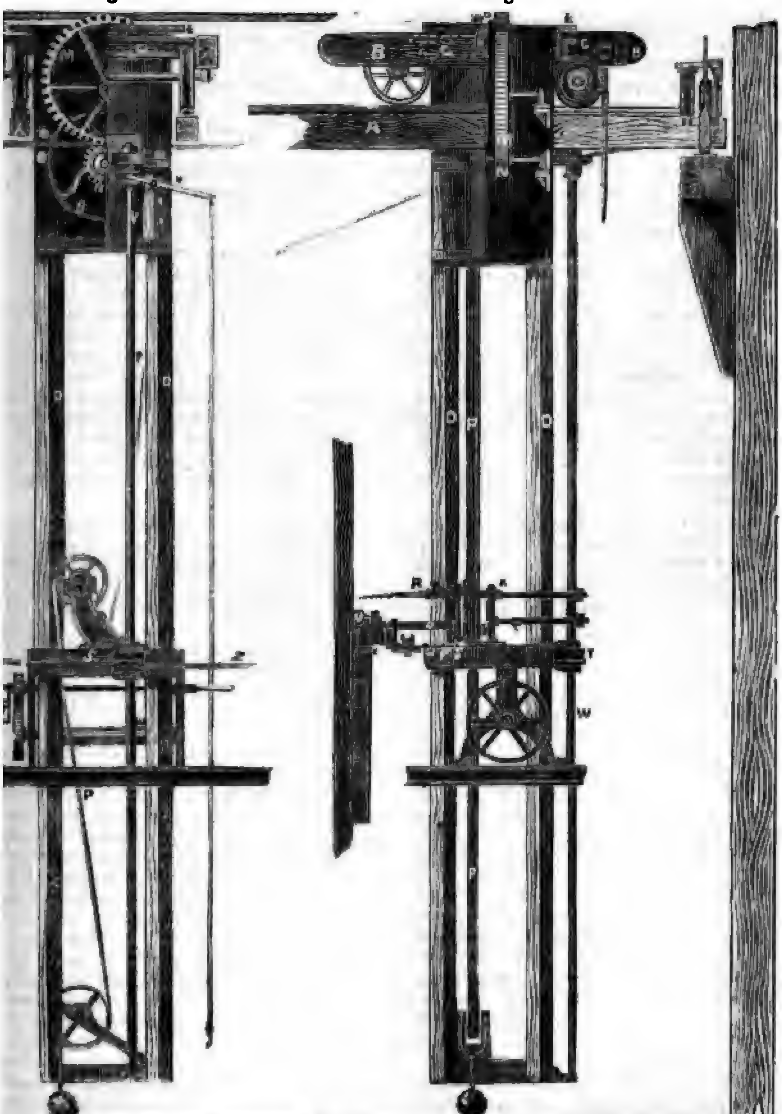
Mechanics' Magazine.

.641.] SATURDAY, JANUARY 20, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

LAMPORT'S IMPROVEMENTS IN SHIPBUILDING.

Fig. 1. Fig. 2.



LAMPORT'S IMPROVEMENTS IN MACHINERY USED IN SHIP-BUILDING.

(Patent dated February 25, 1854.)

Mr. Lamport, of Workington, ship-builder, has patented an arrangement of machinery which is intended to supply the place of hand labour in several of the operations practised by the builders of ships.

In preparing the frame of a ship, the builder usually trims the timbers which are to compose it to the shapes and sizes required by the form of the ship by means of manual labour, as they lie upon the ground. He then hoists them into their places, and after arranging them as accurately as possible, by means of harpins, ribands, shores, &c., trims off from them, by means of adzes, any irregularities that may have arisen from defective moulding and bevelling, or from the straining of the frames, so that they shall present a fair surface to the plank that is afterwards brought upon them. Instead of proceeding in this manner, Mr. Lamport roughs the timbers out with an axe or a saw, and in this state puts the frames together, and, when in place, reduces them to the mouldings and bevellings (marked on each from the moulds in the ordinary way), by means of revolving cutters or planing irons, set in motion by steam or other motive power. For this purpose he employs an ordinary railway for a travelling crane to run the whole length of the slip on which the ship is to be built. Upon, and pendant from, the transverse carriage, he has a moveable frame to sustain the pullies, shafts, wheels, and apparatus necessary to give motion to the cutters, which are so arranged as to move up and down the pendant frame, so as to adjust them to the required height on the frame of the ship, while the travelling carriage will carry the frame along the ship's side, as may be necessary. He communicates motion to the pullies and cutters by means of shafts or continuous bands, either at the level of the railway, or at any advisable height upon the pendant frame, and capable of being raised or lowered as required. He also employs the machinery to bore the bolt and treenail holes in the frames and planks of the ship, by the substitution of centre-bits, augers, or other borers, in place of the cutters. He further employs the machinery to dress and plane the planks on the ship, the stanchions, bulwarks, and other parts, and to mould the rails, gunwales, and other parts, as well as to plane or fair the flat of the deck; and he uses the same machinery to bore the holes in the plates and angle irons, and other parts of iron ships, when in place, so as to ensure the exact coincidence of the several holes in the different parts.

Figs. 1 and 2 represent elevations, partly in section, of the machine, and figs. 3 and 4 are plans, also partly in section, of the upper and lower parts of it. "Upon the cross carriage, A, of an ordinary travelling crane," says the inventor, "the railway for which may be carried along the heads of strong stage poles, or the supports of a shed covering the slip, is placed a small carriage, B, on four wheels, in the middle of which, and between the sides of the cross carriage, A, is a circular iron frame, C, to which are attached, or through staples in which may slide up or down, four pendants of wood or iron, D, D. The top of C is formed by a flange which rests upon and freely turns in a strong iron ring, G, supported by the trunnions or pivots, H, H, resting on the carriage, B. In the ring, or in the flange, are four or more rollers, I, I, so that the frame, C, with its pendants, D, D, can freely turn on its own axis, or swing on the pivots, H, H. Placed within the iron frame, C, is a grooved pulley, K, driven by the rope, L, which extends the whole length of the slipway, and which is kept in its relative position to the frame, C, by guide pullies and a weighted pulley at the farthest extremity. Connected with K are the wheel and pinion, M and N, and the pulley, O, which by the strap, P, drives the planing shaft, Q, and the boring shaft, R. These are attached to a frame and platform, S, which slide up and down the pendants, D, by means of a winch, T, and ropes or racks, so as to adjust the cutters and drills to their required position on the ship's side; or instead of the said frame, S, sliding upon the pendants, I propose to fix it to the bottom of the said pendants, and cause them by the action of the winch, T, to slide up through the frame, C, by which means the said platform, &c., will be always above and out of the way of the stages required along a ship's side. Motion fore and aft the ship is caused by the rotation of the square shaft, W, and pulley, Y, acting upon the stationary rope, Z. The rope being fixed at the stem and stern post of the ship, will oblige the carriage, B, and frame, C, &c., to follow the curve of the ship's side at the same time they move longitudinally, while the sheer curve or curve of the plank upwards is followed by the guides or shoes, E, so as to keep the cutters in their proper place on the ship's side as the machine progresses. The shaft, W, can be stopped or made to reverse its motion by means of the lever and rope, X, acting upon two small bevel wheels. The plate supporting the pedestals and shafts, Q and R, is intended to move fore and aft, so as to allow the cutters, &c., to clear the outside of the pendants, D, D, that they may work under such shores or

props as may be requisite to support the frames, and also angularly by the handle and screw, F, so as to adjust the cutters to a greater degree of nicety than can be done by the turning of the whole frame. The mode of working is as follows:—The ship's frames are roughed out without regard to the exact bevelling by axe or common vertical or circular steam saws, and put together without dressing, the exact curve of the mould being marked clearly on the moulding edge of such set of timbers. The frames are then erected in the ordinary way with strong "ribands," so that as few shores as possible may be required, and a few bilge planks inside and out put on, and firm packings put under the bilges. The machine can then be set to work. The guide-rope, Y, will keep the apparatus close to the ship's side as it moves along, while the guides, E, control the action of the cutters which plane the timbers, until the surface is wrought fair with the moulding line on each timber. By this simple process the form of the frame and the true bevelling will be worked correctly, while

Fig. 3.

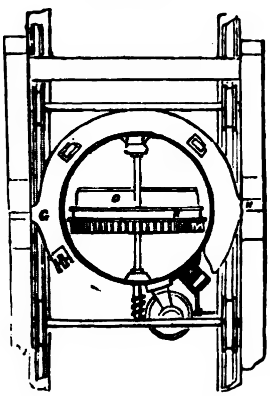
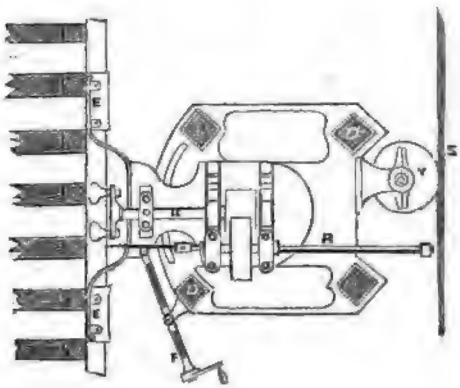


Fig. 4.



the outside edges of the cutters are planing the upper edge of the plank to any given angle with the perpendicular surface of the frame, and ensuring a correct and even seam for caulking. When one machine only is at work on a ship, the carriage, B, must be pushed to the other extremity of A, to the other side of the ship, and the frame, C, and pendants turned entirely round in the ring, G, the driving and guide ropes having been previously detached. In the wake of the shores the machine can be swung or moved off, and brought to again on the other side, the cutter plate and shaft having been caused to traverse sufficiently to work under the shore. At each extremity of the ship, where the timbers incline outwards, the frame, D, D, must be swung until the face of the cutters are parallel to the timber. It may, however, be advisable to work some of the frames aft under the quarter, in the ordinary way."

THE "SCIENTIFIC AMERICAN."

In our number for November 25th, 1854, we drew attention to a series of articles, in course of publication in the above journal, and by comparing passages contained in them with others quoted from Mr. Woodcroft's "Appendix to the Specifications of English Patents for Reaping Machines," established a charge of elaborate plagiarism against its editor. In his number for December 23rd, that gentleman has devoted an article to the consideration of the subject.

The production is certainly characterised by great bitterness, and is evidently intended to accomplish our destruction. We are, nevertheless, disposed to treat it with much forbearance, remembering the difficulties which beset our contemporary in concocting it. The act imputed to him was gross, the evidence perfect, the conclusion unavoidable. No sensible man, therefore, will be surprised to learn that he writes vindictively. Is it not the function of torture to beget rage?

And yet, since rage blinds its possessor, it is a dangerous element in polemics. This our contemporary has unhappily forgotten (much to his detriment); and the consequence is, that as in November we put him

to shame before *our* readers, so he in December, puts himself to shame before *his own*. The composition of our "Scientific" friend is of such a character, that while it necessitates a repulse, it holds forth no invitation to a contest. We see in it no indications of any of those qualities which render an antagonist worthy to be warred with. He does not come

"Breathing and sounding beauteous battle,"

but staggers on to the field with no other weapon than a bludgeon, and no other impulse than revenge. We care not to war with him. Who would feel any pride in confronting an opponent who brings neither honour nor intellect to the combat? Who could experience any delight in contending with a foe who has neither blood for the sword of satire to draw, nor bones for the artillery of syllogisms to crush?

We will, however, offer a few observations to our readers on the rejoinder before us, dealing first with the main subject—the plagiarism—which is, of course, the most painful thing to our contemporary, and a thing he would be most happy to ignore; but

"Our acts our angels are, or good or ill;
Our fatal shadows that walk by us still."

Concerning this plagiarism the plagiarist says many things in which we know not whether *consistency* or *truth* shines the brighter. In the first place, he intimates an intention of acknowledging *hereafter* the source of the borrowed passages. He says, "If the editor had only held on to his bad passions until the close of our series on reapers, he would not have had occasion to expend so much virtuous indignation." We seriously wish, for the honour of our craft, that this poor loop-hole of escape were left open to our contemporary; but, alas! he himself has securely blocked it up, by mutilating what he appropriated. It will be recollected by our readers, that the extracts quoted were so sadly garbled, that they could not, in their new form, be imputed to the author of the "Appendix" without an infliction of injustice, and an exhibition of impudence. Unhappy the man who, having defaced the furtive coin, is able neither to *retain* nor to *return* it! Were we right in naming our contemporary the "Knowing American"?

Again, this far-sighted editor quotes a remark made to him by a "very intelligent foreigner," to the effect that, "the collection of reaping machines is not the work of Mr. Woodcroft, but is a public work, published by authority through that *savan*."

This, most assuredly, is not less, if it be not greater, than an error. The work was prepared wholly by Mr. Woodcroft, before his appointment to the office of the Commissioners of Patents, and is published, not "by the authority," but "under the sanction" of the Commissioners. Besides, if the work *were* a public one, why should any gentleman be simple enough to trouble himself with transposing and eliminating words, and effecting all sorts of insignificant changes in the woodcuts? Why should he not appropriate unaltered what he is not gifted with the power of improving?

Our acute contemporary has, however, yet another justification of himself to offer; and this is embodied in an *argument*. Here it is: "Our readers will notice that we acknowledge the original sources from whence all our information about foreign reapers is derived, by naming the publication; therefore the remarks of the *Magazine* are entirely gratuitous and impertinent." There is a charming *petitio principii!* There is a sensible appeal! The readers of the *Scientific American* will notice that their editor acknowledges the sources whence "all" his information is derived! Indeed! Then they will, of course, notice that the editor has acknowledged what he just now said he intended to acknowledge "at the close of our series on reapers." He who is dull in the execution of knavery, evidently should not enter upon his own defence. Our readers will see that they could be furnished with no stronger confirmation of the charge of plagiarism than is supplied in the reply of the plagiarist.

We have already said that our contemporary has sought to compass our destruction. We have now to add, that in pursuing this object, he has recourse to most curious expedients. For instance, he first assails our reputation by establishing our impartiality. This he does, very effectually, by quoting a foot note appended to certain remarks of ours, on American "literary and scientific pyrotechnics," in November, 1853. In this note we mentioned the *Scientific American* as one of several American journals, in which sensible improvements had taken place. We did so honestly and cheerfully, and regret that our contemporary has made that praise, which he has shown we are anxious to render, no longer appropriate.

The *Scientific American* then speculates upon the causes of our *exposé* of his plagiarism (which to him are, of course, quite occult); and hits upon this elucidation: "Our list" (of subscribers) "comprises English lords. * * * Perhaps a knowledge of these facts are like a thorn in the editor's side." Oh, Republican contemporary!

Here is another guess: "Or perhaps he is smarting under our defence of Mr. Hobbs." The secret of this passage is contained in the fact, that on our announcing

the picking of Mr. Hobbs's locks by Mr. Goater, the *Scientific American* immediately proclaimed, *on our authority*, that the celebrated Newell lock had been picked, and some time after attacked us for what its own blundering had effected. We did not take the trouble to reply or explain, because our language was, at the first, perfectly intelligible; it was as follows: "In short, Mr. Hobbs, *by falling back upon the large and expensive lock*, attempts to divert public attention from the fact that the principal part of the locks issued by him may be picked in a very few minutes."

There is but one other thing suggested in the article before us, which calls for an observation, viz., the *Scientific American's* estimate of itself, which is extremely high, (and which will probably lead to an enormous increase in its circulation.) The "editorial labour" which that journal "contains," is a theme on which the "editor" dwells with great delight. We shall not here enter upon a general criticism of the publication, because that might divert attention from the *plagiarism* which is *our* theme. But as we are dealing with the "editorial page" of the number for December 23rd, in which the article in question appears, we will just indicate its contents, and leave our readers to draw their own inferences. This page contains four articles (in addition to that already discussed), headed as follows:— "Light and Color"—"On the Patentability and Patenting of Inventions"—"Fine Writing"—"570 Dollars in Prizes"; and an announcement. The first of these we shall notice in the sequel. The second is almost entirely devoted to the publication of "several reasons why we think that intending patentees will invariably promote their own interests *by having their patents prepared through our establishment*."* The third declares that a "Mr. McDowall, of Bolivar," "has embraced in a circle of one inch in diameter," as much information as "would occupy more than two columns of printed matter in the SCIENTIFIC AMERICAN"!! The fourth is an advertisement that "The Publishers" (and they are the Editors also, be it observed) "of the SCIENTIFIC AMERICAN, offer the following cash prices for the fourteen largest lists of subscribers sent in by the 1st of January, 1855."† The announcement, before mentioned, communicates the fact that an individual "of the SCIENTIFIC AMERICAN" has been elected to an Honorary office in this country.

And now a word or two on the "light and color" editorial, which completes the "Editorial page." No, not a word or two; two quotations shall suffice. Here they are:—"The red bird, dancing from bush to bush, and the butterfly from flower to flower, charm us with the beauty of their plumage; and the flowers themselves, from the modest daisy to the stately dahlia, thrill us with delight. How pungent the truth 'Man shall not live by bread alone.'" (Was not that Transcendental Lady whom Mr. Chuzzlewit heard exclaiming "Howls the sublime, and 'softly sleeps the calm ideal," on the staff of the *Scientific American?*) —"Strange as it may appear, however (and this shows the peculiar relationship of the immaterial within, with the universe without,) colors have no material existence; 'What,' one may say, 'has the rose no color, and is the purple of the violet a delusion?' It is even so."*

---

* The italics are ours.—ED. M. M.

† The editor of the *Scientific American* affirms, that his journal has a large circulation. If this be true, there is but little excuse for the insolence with which the readers of that paper are treated in the carrying out of this system of offering prizes for lists of subscribers. The practice is of itself not a little disgusting to a "Scientific Englishman," but when pushed to the extent indicated by the following quotations it certainly becomes extremely vile. The *Scientific American* for October 28, 1854, after a column of clap-trap, wound up by an announcement of these prizes, goes on to say: "It strikes us, that any young man to whom a knowledge of these opportunities come, and who refuses to take advantage of them, on the ground of apparent difficulty or trouble, should not complain if his friends write him down as a dolt, and turn the cold shoulder upon him in times of actual need." And then suggests, that "those whose occupations prevent them from going about in the day-time, might, we think, employ a portion of their evenings for the purpose."

In the number for December 2, 1854, we observe an article headed "A WINDFALL FOR SOME ONE." In this we read a tedious tale about a "legacy bequeathed to some fourteen different persons, name unknown;" "not a large sum, to be sure, but still worth having, when money is so scarce and times so hard as at present," and afterwards reach these remarks: "*Modesty* has thus far hindered us from presenting a more explicit exposition of this practically benevolent project; but we feel that at this stage of the subject we must be definite. The donors referred to are the proprietors of the SCIENTIFIC AMERICAN, and the bequest is contained in their liberal prize list, which foots the lower corner of this very page." The article concludes thus: "Do you want, nay, *will you accept* of this liberal legacy? Here it is. We hold it up plainly to your view. You have but to say one word. If you say YES, then put forth your hands—bring out your subscription list—comply with our published terms—*and the money is yours*." We do not wonder that this showman thinks us "a good specimen of 'learned dulness.'"

* We find, on glancing over our remarks, that we have omitted to discuss the following important sentence of our contemporary:—"We have our eye now upon an article in a late number" of the *Mechanics' Magazine*, "*stolen* from the *Scientific American*." We call upon our contemporary to point out the article in question. We cannot, of course, deny the statement broadly, since we know

ON THE POSSIBLE DENSITY OF THE LUMINIFEROUS MEDIUM; AND ON THE MECHANICAL VALUE OF A CUBIC MILE OF SUNLIGHT.

BY PROFESSOR WILLIAM THOMSON.*

THAT there must be a medium forming a continuous material communication throughout space to the remotest visible body is a fundamental assumption in the undulatory theory of light. Whether or not this medium is (as appears to me most probable) a continuation of our own atmosphere, its existence is a fact that cannot be questioned, when the overwhelming evidence in favour of the undulatory theory is considered; and the investigation of its properties in every possible way becomes an object of the greatest interest. A first question would naturally occur, What is the absolute density of the luminiferous æther in any part of space? I am not aware of any attempt having hitherto been made to answer this question, and the present state of science does not in fact afford sufficient data. It has, however, occurred to me that we may assign an inferior limit to the density of the luminiferous medium in interplanetary space by considering the mechanical value of sunlight as deduced in preceding communications to the Royal Society from Pouillet's data on solar radiation, and Joule's mechanical equivalent of the thermal unit. Thus the value of solar radiation per second per square foot at the earth's distance from the sun, estimated at ·06 of a thermal unit Centigrade, or 83 foot-pounds, is the same as the mechanical value of sunlight in the luminiferous medium through a space of as many cubic feet as the number of linear feet of propagation of light per second. Hence the mechanical value of the whole energy, actual and potential, of the disturbance kept up in the space of a cubic foot at the earth's distance from the sun,† is $\frac{83}{192000 \times 5280}$, or $\frac{\cdot 819}{10^7}$ of a foot-pound. The mechanical value of a cubic mile of sunlight is consequently 12050 foot-pounds, equivalent to the work of one-horse power for a third of a minute. This result may give some idea of the actual amount of mechanical energy of the luminiferous motions and forces within our own atmosphere. Merely to commence the illumination of three cubic miles, requires an amount of work equal to that of a horse-power for a minute; the same amount of energy exists in that space as long as light continues to traverse it; and, if the source of light be suddenly stopped, must be remitted from it before the illumination ceases.* The matter which possesses this energy is the luminiferous medium. If, then, we knew the velocities of the vibratory motions, we might ascertain the density of the luminiferous medium; or, conversely, if we know the density of the medium, we might determine the average velocity of the moving particles. Without any such definite knowledge, we may assign a superior limit to the velocities, and deduce an inferior limit to the quantity of matter, by considering the nature of the motions which constitute waves of light. For it appears certain that the amplitudes of the vibrations constituting radiant heat and light must be but small fractions of the wave lengths, and that the greatest velocities of the vibrating particles must be very small in comparison with the velocity of propagation of the waves. Let us consider, for instance, plane-polarized light, and let the greatest velocity of vibration be denoted by v; the distance to which a particle vibrates on each side of its position of equilibrium, by A; and the wave length, by λ. Then if V denote the velocity of propagation of light or radiant heat, we have

$$\frac{v}{V} = 2\pi \frac{A}{\lambda};$$

and therefore if A be a small fraction of λ, v must also be a small fraction (2π times as great) of V. The same relation holds for circularly-polarized light, since in the time during which a particle revolves once round in a circle of radius A, the wave has been propagated over a space equal to λ. Now the whole mechanical value of homogeneous plane-polarized light in any infinitely small space containing only particles sensibly in the same phase of vibration, which consists entirely of potential energy at the instants

---

not what is meant by a "late number," and since an omission may have been made by accident. We confidently affirm three things:—1. If we have neglected to attribute to the *Scientific American* an article transferred from its pages to our own, the circumstance is the result of an oversight. 2. If an article, so transferred, exist, it has not been garbled. 3. If an article, so transferred, exist, it was not written by the Editor of the *Scientific American*, or *we certainly should not have reproduced it.*

* From the Transactions of the Royal Society of Edinburgh, vol. xxi. part 1; through *Philosophical Magazine.*

† The mechanical value of sunlight in any space near the sun's surface must be greater than in an equal space at the earth's distance, in the ratio of the square of the earth's distance to the square of the sun's radius, that is, in the ratio of 46,400 to 1 nearly. The mechanical value of a cubic foot of sunlight near the sun must, therefore, be about ·0038 of a foot-pound, and that of a cubic mile 560,000,000 foot-pounds.

* Similarly we find 15,000 horse-power for a minute as the amount of work required to generate the energy existing in a cubic mile of light near the sun.

when the particles are at rest at the extremities of their excursions, partly of potential and partly of actual energy when they are moving to or from their positions of equilibrium, and wholly of actual energy when they are passing through these positions, is of constant amount, and must therefore be at every instant equal to half the mass multiplied by the square of the velocity the particles have in the last mentioned case. But the velocity of any particle passing through its position of equilibrium is the greatest velocity of vibration, which has been denoted by v; and, therefore, if ρ denote the quantity of vibrating matter contained in a certain space, a space of unit volume for instance, the whole mechanical value of all the energy, both actual and potential, of the disturbance within that space at any time is $\frac{1}{2}\rho v^2$. The mechanical energy of circularly-polarized light at every instance is (as has been pointed out to me by Professor Stokes) half actual energy of the revolving particles and half potential energy of the distortion kept up in the luminiferous medium; and, therefore, v being now taken to denote the constant velocity of motion of each particle, double the preceding expression gives the mechanical value of the whole disturbance in a unit of volume in the present case. Hence it is clear, that for any elliptically-polarized light the mechanical value of the disturbance in a unit of volume will be between $\frac{1}{2}\rho v^2$ and ρv^2, if v still denote the greatest velocity of the vibrating particles. The mechanical value of the disturbance kept up by a number of coexisting series of waves of different periods, polarized in the same plane, is the sum of the mechanical values due to each homogeneous series separately, and the greatest velocity that can possibly be acquired by any vibrating particle is the sum of the separate velocities due to the different series. Exactly the same remark applies to coexistent series of circularly-polarized waves of different periods. Hence the mechanical value is certainly less than *half* the mass multiplied into the square of the greatest velocity acquired by a particle, when the disturbance consists in the superposition of different series of plane-polarized waves; and we may conclude, for every kind of radiation of light or heat except a series of homogeneous circularly-polarized waves, that *the mechanical value of the disturbance kept up in any space is less than the product of the mass into the square of the greatest velocity acquired by a vibrating particle in the varying phases of its motion.* How much less in such a complex radiation as that of sunlight and heat we cannot tell, because we do not know how much the velocity of a particle may mount up, perhaps even to a considerable value in comparison with the velocity of propagation, at some instant by the superposition of different motions chancing to agree; but we may be sure that the product of the mass into the square of an ordinary maximum velocity, or of the mean of a great many successive maximum velocities of a vibrating particle, cannot exceed in any great ratio the true mechanical value of the disturbance. Recurring, however, to the definite expression for the mechanical value of the disturbance in the case of homogeneous circularly-polarized light, the only case in which the velocities of all particles are constant and the same, we may define the mean velocity of vibration in any case as such a velocity that the product of its square into the mass of the vibrating particles is equal to the whole mechanical value, in actual and potential energy, of the disturbance in a certain space traversed by it; and from all we know of the mechanical theory of undulations, it seems certain that this velocity must be a very small fraction of the velocity of propagation in the most intense light or radiant heat which is propagated according to known laws. Denoting this velocity for the case of sunlight at the earth's distance from the sun by v, and calling W the mass in pounds of any volume of the luminiferous æther, we have for the mechanical value of the disturbance in the same space,

$$\frac{W}{g}v^2,$$

where g is the number 32·2, measuring in absolute units of force, the force of gravity on a pound. Now we found above, from observation, $\frac{83}{V}$ for the mechanical value, in foot-pounds, of a cubic foot of sunlight; and therefore the mass, in pounds, of a cubic foot of the æther, must be given by the equation,

$$W=\frac{32{\cdot}2\times 83}{v^2 V}.$$

If we assume $v=\frac{1}{n}V$, this becomes

$$W=\frac{32{\cdot}2\times 83}{V^3}\times n^2=\frac{32{\cdot}2\times 83}{(192000\times 5280)^3}\times n^2=\frac{n}{3899\times 10^{20}};$$

and for the mass, in pounds, of a cubic mile we have

$$\frac{32 \cdot 2 \times 83}{192000)^8} \times n^2 = \frac{n^2}{2649 \times 10^9}.$$

It is quite impossible to fix a definite limit to the ratio which v may bear to V; but it appears improbable that it could be more, for instance, than $\frac{1}{50}$, for any kind of light following the observed laws. We may conclude that probably a cubic foot of the luminiferous medium in the space traversed by the earth contains not less than $\frac{1}{1560 \times 10^{17}}$ of a pound of matter, and a cubic mile not less than $\frac{1}{1060 \times 10^6}$.

If the mean velocity of the vibrations of light within a spherical surface concentric with the sun and passing through the earth were equal to the earth's velocity—a very tolerable supposition—since this is $\frac{1}{10170}$ of the velocity of light, the whole mass of the luminiferous medium within that space would be $\frac{1}{50000}$ of the earth's mass, since the mechanical value of the light within it, being as much as the sun radiates in about eight minutes, is about $\frac{1}{15000}$ of the mechanical value of the earth's motion. As the mean velocity of the vibrations might be many times greater than has been supposed in this case, the mass of the medium might be considerably less than this; but we may be sure it is not incomparably less, not 100,000 times as small, for instance. On the other hand, it is worth remarking that the preceding estimate shows that what we know of the mechanical value of light renders it in no way probable that the masses of luminiferous medium in interplanetary spaces, or all round the sun in volumes of which the linear dimensions are comparable with the dimensions of the planets' orbits, are otherwise than excessively small in comparison with the masses of the planets.

But it is also worth observing that the luminiferous medium is enormously denser than the continuation of the terrestrial atmosphere would be in interplanetary space, if rarified according to Boyle's law always, and if the earth were at rest in a space of constant temperature with an atmosphere of the actual density at its surface.* Thus the mass of air in a cubic foot of distant space several times the earth's radius off, on this hypothesis, would be $\frac{1 \text{ lb.}}{442 \times 10^{846}}$; while there cannot, according to the preceding estimate, be in reality less than $\frac{1 \text{ lb.}}{1560 \times 10^{17}}$, which is 9×10^{827} times as much, of matter in every cubic foot of space traversed by the earth.

* "Newton has calculated (Princ. iii. p. 512) that a globe of ordinary density at the earth's surface, of 1 inch in diameter, if reduced to the density due to the altitude above the surface of one radius of the earth, would occupy a sphere exceeding in radius the orbit of Saturn."—(Herschel's Astronomy, Note on § 559.) It would (on the hypothesis stated in the text) we may now say occupy a sphere exceeding in radius millions of millions of times the distances of any stars of which the parallaxes have been determined. A pound of the medium, in the space traversed by the earth, cannot occupy more than the bulk of a cube 1,000 miles in side. The earth itself, in moving through it, cannot displace less than 250 pounds of matter.

INDUSTRIAL PATHOLOGY:

ON TRADES WHICH AFFECT THE EYES.

We have already directed the attention of our readers to a notable movement, made by the Society of Arts, for the purpose of obtaining and spreading information respecting the operations of various industrial processes upon the lives and healths of those engaged in them. The committee appointed by the Society resolved last year first to direct their attention to injuries sustained by the eye alone. They have accordingly done so, and recently presented to the council a report of their investigations. The report is short, and not very comprehensive, in extenuation of which fact two reasons are urged, viz.: the novelty of the subject to the public, and the introduction into the communications of correspondents of much irrelevant matter.

There is, however, in the report, what appears to us an evident discrepancy. For, after stating that "many classes *from whom it was hoped a good deal might be learned*, did not undertake to reply to the questions," the committee proceed to offer the shortness and meagreness of the report, "as a fair subject of congratulation," and say, "It appears, from the constant repetitions by different persons of the same lesions, and the little novel or original information that has been elicited, that the important organ of vision is much less injured directly by handicraft operations than the committee thought." Would it not have been more consistent to have reserved all congratulation of the kind, until we are told more of those "from whom it was hoped a good deal might be learned," than that they have not undertaken to give us the results of their experience? We venture to suggest, that according to their own representations, the committee have but imperfectly performed their labours.

It is, nevertheless, very gratifying to find that many of the injuries complained of by workmen seem to result from ignorance or neglect of well-known hygienic laws, rather than from circumstances inseparable from their occupations; and also, "that all the results complained of seem capable of being met by simple, cheap, and universally attain-

able means: no alterations of modes of manufacture, no interference with the natural liberty of the master to have work done in the cheapest way, is necessary; but merely such precautions as it is monstrous not to adopt when once known."

The following is a summary of the information obtained by the committee :—

1. That the following classes of artisans are exposed to injury of the eyes from chips, splinters, dust, grit, or fluff, viz., engineers, masons, stonecutters, stonebreakers, bricklayers, soda-water bottlers, turners, fitters, hammermen and smiths, cutlers, railway guards, rock blasters and quarrymen, millers, chimney-sweeps, workers in cotton, flax dressers, feather cleaners, drug grinders (especially in grinding blistering flies), shoe-makers, (from breaking of the awl); and that the following appliances have been found useful in preventing the ill consequences of such exposure, viz., for those liable to blows from large portions of hard substances, such as stonebreakers, &c. coarse metal netting as eye guards, and for those exposed to the finer dust, crape spectacles, while at the same time free ventilation of the apartments they work in would relieve much of the inconvenience.

2. That the following suffer from the chemical nature of the substances which, in the shape of solid particles get under the eyelids, viz., bricklayers, workers in lime, workers in potash.

No special preventive seems to be here pointed out beyond the placing within reach of the workmen the ready means of immediately cleansing the parts with pure water. Some such apparatus as that described in Mr. White Cooper's communication (in which a jet is forced upwards by the pressure of a head of water) might be placed in the workshop or superintendent's office.

(The action of chemical fumes, strictly so-called, has not been reported to cause injury.)

3. That the following suffer from excess of light or glare proceeding from the material used, viz., furnace men, gilders, bookbinders.

No practical remedy for this inconvenience has been suggested, as spectacles which intercept the light would diminish the efficiency of the workman.

It may be observed that there is a great difference between excessive illumination of the work, and excess of light on the eye. The latter is the most common, and is considered under a separate head.

4. That the following suffer from deficiency of light, viz., dressmakers, tailors, sempstresses, cobblers, and, in fact all who, having to direct the needle to a definite spot, are unable to command the requisite amount of direct illumination.

5. That the ill effects of deficiency of light are much aggravated by working long on the same material or colour. The remedies for this and the foregoing evil are, increase of light and variety of work.

6. That flickering of light is a great evil, which is felt much by compositors and all who work at minute objects by gas illumination.

The simple remedy for this is the employment of glass chimneys.

7. It seems improper that an equal quantity of artificial light should fall on the work and on the eyes of the workman. If that is the case, the latter become overstrained.

This evil, when it occurs, is easily obviated by shades to the light, which defend the eye, and throw the illumination on the required object. The shades should be made of white or light coloured material, so as to reflect as much light as possible. Ground glass between the light and the worker is injurious, by intercepting and diffusing the illumination instead of directing it on to the object.

8. It seems doubtful whether heat and cold have much ill influences over the healthy eye; but when it is in a weak irritated condition, there is no doubt but that they are injurious.

9. Bad ventilation, constrained postures, over-indulgence in spirituous liquors, the fumes of tobacco, and all other violations of healthy habits, are injurious to the eyes at the same time as to the rest of the body, and aggravate the bad effects of the above-named industrial occupations.

10. The employment of the eye when the body is in an exhausted state from want of food, prolonged working hours, mental distress, &c., even in handicrafts not of themselves pernicious, is very detrimental to the organ. So that the later periods of work are those which are found most materially to weaken the sight and injure the eye.

The shortening of working hours would probably be a saving in the end to both master and artisan; for the faulty execution of that which is completed with an imperfect organ must be a loss to the former, while the latter is ill remunerated by slightly increased wages for the risk of illness which he runs.

FOARD'S SMOKELESS FURNACE PATENT.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Wednesday, January 10, 1855.

Present—Sir John Dodson, Mr. Pemberton Leigh, and Sir Edward Ryan.

MR. HINDMARCH appeared in support of

a petition for the prolongation of the patent granted to Mr. Foard in 1841, which was described in our last volume, page 619, and stated that as, up to a recent period, there had been no means of compelling those who used furnaces or large fires to adopt appliances for the consumption of the smoke arising from them, the patentee had experienced the greatest difficulty in inducing any persons to adopt his invention. He had employed every means in his power to bring it into public use. It had been tried in her Majesty's dockyard at Woolwich with perfect success, until the building in which it was erected was pulled down. In the new building the smoke from all the furnaces was carried into one chimney; consequently it was of no use to employ the apparatus, unless it was adopted in every furnace. Mr. Foard assigned part of his interest to two gentlemen of the name of Godson, but only three or four persons had been induced to have recourse to it. It has since been re-assigned. The important part of the construction was, that it kept the heat up to such a temperature as to compel combustion before smoke could escape from the furnace. Fuel was ordinarily placed on the top of the fire, and the smoke immediately ascended; but in this invention it was introduced at the bottom, so that all the matters escaping from the coal must rise through a red-hot fire, and there being an apparatus for supplying the requisite quantity of atmospheric air, the combustion was perfect.

Mr. Lucas, the owner of a splitting-mill; Mr. Beckett, a drug-grinder; and Mr. Gordon, a distiller, stated that they had employed Foard's invention, which was cheap in its construction, and economical in its operation. They estimated the saving of fuel at from 15 to 20 per cent.

Mr. Grissell and Mr. Maudslay, engineers, deposed to the efficiency of the apparatus. The latter gentleman observed that he was convinced the public would not adopt any invention for consuming smoke unless they were compelled to do so by fines.

Mr. Sheves, foreman to Mr. Grissell, considered this invention to be better than most others employed for the same purpose. In Jukes's apparatus there must be a motive power to work it, but in Foard's it could be done by the stoker.

Mr. Edward Godson proved that the loss sustained by the parties interested in the patent had exceeded £1,200.

Mr. Welsby, on the part of the Attorney-General, did not dispute the efficiency of the machine; but, as it was probable that an act of Parliament would be passed compelling the consumption of smoke in all manufactories throughout the kingdom, he hoped their Lordships would not extend the patent, and thereby impose a burden on the public for the term asked for—14 years.

Mr. Pemberton Leigh, in delivering the judgment of their Lordships, said the invention was proved to be extremely useful, and a heavy loss had been incurred. It was probable that by a moderate extension of the patent some remuneration would be received. Their Lordships would advise Her Majesty to prolong the patent for six years.

LOWE'S PATENT FOR SUPPLYING AND PURIFYING GAS.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Thursday, January 11, 1855.

Present—Sir John Dodson, Mr. Pemberton Leigh, and Sir Edward Ryan.

Mr. Webster appeared in support of a petition of a prolongation of a patent for "Improved methods of supplying gas under certain circumstances, and of improving its purity," granted to Mr. G. Lowe, March 16, 1841, and stated that the gas supplied by public companies had long been known to contain many impurities, which prevented it from being used for domestic purposes to the same extent in London and other parts of this country as it was in Edinburgh, where it was obtained from a different sort of coal. At certain times and in certain localities there was a deficiency of supply. The object of the patent was to obviate all these objections. During the day the pressure of the gas as supplied by the companies was frequently insufficient to force it through the meter, but Mr. Lowe added to the meter a motive power which remedied the defect. He had also succeeded in inventing an apparatus by means of which the gas was purified of sulphuretted hydrogen, carbonic acid, and ammonia, with its compounds, the gas being at the same time saturated with naphtha, by which its illuminating power was greatly increased. The apparatus was so simple that it could be placed with perfect ease and safety on the same shelf as the common meter. The result was that gas could be burnt in private houses with great comfort, and at a large saving of expense to the consumer. Hitherto the receipts from the working of the patent had not been equal to the outlay incurred in procuring it; but, public attention being now aroused to the importance of pure gas, there was every probability of its becoming remunerative.

Mr. Lowe having described his apparatus and illustrated its efficiency by experiment,

Sir James Clarke, Professor Brand, Mr. Smee, of the Bank of England, Mr. Waddington, the manager of Apothecaries Hall and inspector of gas on the south side of the Thames, and Professor Hoffman were examined, and spoke in unqualified terms of the utility and perfect operation of the invention. Mr. Smee exhibited the cover of a book which had been destroyed in a public library by the impure quality of the gas consumed. He stated that in Russian leather the action took place at the angle where the back of the cover was attached to the sides, and in calf binding the leather peeled off in flakes. The sulphurous acid in the leather was perceptible to the taste.

Mr. Welsby, on behalf of the Attorney-General, offered no opposition.

Sir E. Ryan said their Lordships were of opinion that there was considerable merit in the invention, and they would advise Her Majesty to extend the patent for five years

DE BERGUE'S PATENT PROPELLER FOR SHIPS.

(Patent dated April 6, 1854.)

Mr. Charles De Bergue, of Dowgate-hill, London, has patented a propeller which consists of a body rocking in the water in such manner, that its upper and under sides shall alternately present a moving inclined surface to the water on which it acts, forcing it through a surrounding chamber.

Fig. 1 represents a transverse, and fig. 2 a broadside view of the propeller, applied to the side of a vessel beneath the position usually occupied by the paddle-wheel. A is the hull of the ship, B the deck, C the steam-engine shaft. The opposite extremities of this shaft, which project a little on each side of the vessel, are supported in suitable bearings, and furnished with cranks, D, which transmit the motion to the propeller. E represents the case or chamber, open at each end, placed longitudinally with regard to the vessel, and so as to be entirely submerged below the surface of the water. This case is constructed in a substantial manner of stout sheet iron, and riveted, bolted, or otherwise firmly secured to the hull of the vessel, the outer side of the chamber being further supported and

Fig. 2.

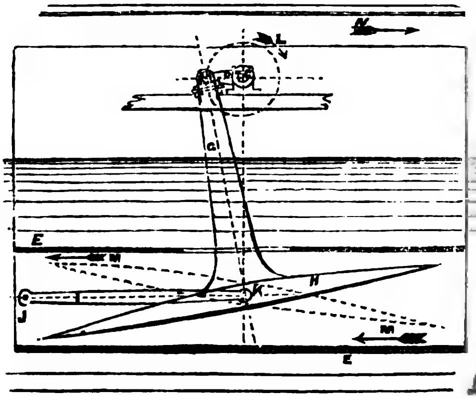
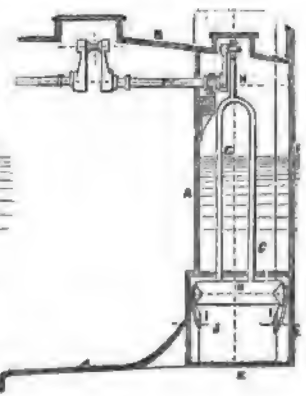


Fig. 1.



strengthened by the side, F, which is also made of iron, and is attached at its upper part to the beams of the vessel, or in any other suitable manner. Two slots are formed in the upper part of the case to allow the free action of the arms or connecting rod of the rocking body. Provision should also be made in the construction of the upper part of the case, so that a part of it may be removed or taken away for the convenience of inserting or removing the blade and connecting rod. H is the rocking body, being in fact a working blade, which acts against the water, and a forked piece, G, is either formed in one with, or firmly attached to, the blade, H, serving as a connecting rod or arm to communicate the motion from the crank, D, to the blade, the latter being guided by two arms, I, made of flat bar iron, and placed in the interior of the chamber, one on each side of the blade, H, so as not to hinder its action. These

arms vibrate at one of their extremities, each on one of the studs or pivots, J, J, fixed to the sides of the chamber, E, and the other end of each is firmly secured to each extremity of the small shaft, K, which is seen in section in fig. 2, and which works freely in the blade, H; it is this shaft which constitutes the centre or axis on which the rocking motion of the blade takes place. All the working parts which, on account of their working under water, cannot be lubricated, should be properly bushed with brass or gun metal. The inventor prefers to construct the case or chamber, E (particularly its upper or top side), so as in length rather to exceed that of the blade, H, and of such capacity and form as to allow the to and fro and rocking action of the blade (without the blade getting in actual contact with any part of the inner surface of the chamber), and yet only slightly to exceed the space traversed over by the blade during its action.

It will be observed, that when the shaft, C, is set in motion by the engines in the direction of the arrow, L, fig. 2, the cranks, D, produce on each of the blades, H, by means of the connecting rods, G, a to and fro and a rocking motion on the centre or axis, K, by which the propeller is moved into the various positions shown by lines or dotted lines in fig. 2. The arrow, M, fig. 2, shows the direction of the current produced by the action of the blade, H, in the chambers, and the arrow, N, shows the direction of the motion thereby given to the vessel.

It will be observed, that by reversing the motion of the engines, and by turning the cranks in the contrary direction to that indicated by the arrow, L, the current given to the water by the blade, H, will be in the contrary direction. It may likewise be observed, that the chamber, E, and the blade, H, are wider at the centre than at the extremities. This is for the purpose of increasing the area of the chamber in the centre, which otherwise would be more confined than at the extremities, in consequence of the greater thickness it is necessary to give to the blade, H, at the centre than at the ends. "To compensate," says Mr. de Bergue, "for the increased velocity which it may be necessary to give to the water during its passage through the chamber over and above that at which it enters (in order to the more satisfactorily working or efficiency of this propeller), I purpose constructing the chamber, and also the blade, H, of an uniform width from the front end or mouth of the chamber to the middle of their length, and narrowing them only at their opposite ends, whereby I apprehend the requisite quantity of water will be received in front to compensate for the increased velocity acquired during its passage through the chamber. Or this object may be attained by making the chamber and the blade to taper or diminish in width from the front end or mouth of the chamber to the opposite end throughout the entire length, and either by a curved or a straight taper, as may be desired."

The blade, H, and the forked connecting rod are formed of wrought iron, and are so connected as to constitute a strong and substantial framing, the blade being covered with iron plates firmly riveted together, and to the framing of the blade, so that the interior, being hollow, and made impervious to water, the propeller will have a floating tendency, and its buoyancy will render it self-supporting. But the blade may be made of any other suitable substance. These propellers, which may be placed at any suitable part of the vessel, and in any suitable number, should always be completely submerged.

The inventor states that his apparatus may also be used either to displace or to force water or any other kind of liquids instead of pumps or pumping apparatus, and (being placed in a stream of water) may also serve in place of a water-wheel as a prime mover.

SELF-CAPPING RIFLE.

At the close of the meeting of the Institution of Civil Engineers on January 9th, 1855, Monsieur Néron, of Paris, exhibited an ingenious mode of placing detonating caps on the nipple of a rifle or a musket. The apparatus consisted of a tube containing twenty-two caps, placed parallel with and close beside the barrel, being partially inserted in the stock, and so arranged, that whilst the near end was attached by a pin to the hammer, the further extremity was free to travel in a slot. Its action was very simple; the tube being filled with caps from a reservoir, several of which would occupy but a very small space, the end cover was turned down. On drawing the hammer to half cock the tube was drawn forward, until a cap was brought over the nipple, and at full-cock the cap was pressed down upon it. After firing, if any portion of the copper remained attached to the cap, it was removed by a small picker preceding the tube, on its being again drawn forward to repeat the operation.

It was evident that by this simple and cheap addition to any fire-arm much time must be saved in loading, and a great waste of caps must be avoided, whilst about 25 per cent. of copper was saved in making the

caps, and they were kept dry in the reservoir, instead of being exposed to damp and running the risk of not exploding, as had occurred frequently in action on recent occasions in the Crimea.

The system was stated to have obtained the approbation of the highest military authorities in France, and with the characteristic alacrity of the Government of that country, to be already in process of adaptation to the Minié rifles and to fire-arms of all kinds for the army; it had, only within the last few days, been brought here to lay before the English Government, and was submitted for the inspection of the members of the Institution of Civil Engineers.

—◇—

RE-PATENTED RE-INVENTIONS.

To the Editor of the Mechanics' Magazine.

SIR,—Still they come—another and another still. What a fruitful source, if not of *invention*, at least of *re-invention* has the new cheap patent law become! In your Number of December 30th, I enumerated several of the more recent re-inventions, including Woodcock's, Prideaux's, Hill's, O'Regan's, and Parker's, of the original "perforated air distributors," patented in 1839. By that invention the air was admitted in *divided portions, films, or jets*; the effect is the same, namely, the producing a rapid and almost instantaneous mechanical mixture and contact of atoms, between the gas and the air—that being the *sine quâ non* of atomic *chemical* union—which is combustion. Your Number of this day, just come to hand, gives a drawing and description of another patented re-invention of the same; viz., "Bayliss's patent smokeless furnace." It certainly would not be worth the ink used, to demonstrate this last act of re-inventive duplicity, except that it is important to keep the public mind alive to these continuing impositions. That Bayliss's patent is one of this class, is palpable from his own description. "The principal gases," he observes, "we have to deal with in a furnace are, carburetted hydrogen, bi-carburetted hydrogen, and carbonic oxide, the atoms of which must be chemically united with oxygen derived from the air, before combustion can take place." (Bayliss has not studied my treatise correctly, or he would not have here introduced *carbonic oxide*, which is not one of the gases "arising from heated fuel.") He continues: "The difficulty has hitherto been" (not since 1839), "to accomplish this union, for the gases, sweeping along at the rate of 30 feet per second, there is not sufficient time for a thorough mixture of them with the air to take place." In justice to me, he should have given the chapter and page of my treatise, where this is so fully explained and insisted on.

He proceeds: "I therefore propose to compensate for this want of time by dividing the gases into a number of small streams or bodies, and *forcing them into mechanical mixture* with the air, to facilitate the *chemical* union with oxygen, and produce a combustible mixture." Here, again, he should have quoted my treatise, either first, second, or third edition; for no where else can he find the necessity of thus forcing a *mechanical mixture* as an essential to *chemical union* described as an incident to the combustion of the coal gases in a furnace.

This operation he proposes to effect by a "series of admixers," having spaces between them for the admission of the air, "to commingle with the gases." Again: "perforated plates of metal or slabs of fire-clay *might be* used instead of the admixers (they, however, being the best possible admixers), and these may be placed horizontally or vertically, as is thought best."

Now, had his patent referred alone to these "*perforated plates*," the effect would have been all-sufficient, inasmuch as they supply the cheapest as well as the most effective means of producing *mechanical* mixture and *chemical* union between the air and the gases. This, however, would have been too simple, and would not have afforded room for that display of ingenuity and complication by which high patent charges and "royalties" appear justifiable, as has been demonstrated by Prideaux, with his silly self-acting valve, and Woodcock, with his equally silly Venetian ash-pit blinds; as if either had anything whatever to do with combustion, except occasionally to impede it.

As corroborative of the accuracy of Mr. Bayliss's second-hand descriptive faculty, and the correctness of his imitative mechanical mixing process, I give an extract from the claim, in the patent of 1839, by which "a quicker and more complete incorporation of the combustible gas and the air is effected, and the formation of smoke prevented;" viz., "Having thus described the nature of my invention, I specially claim the use, construction, and application of the *perforated air distributor*, by which the atmospheric air is more immediately and intimately blended with the combustible gases in the furnace." Will Mr. Bayliss exercise his ingenuity, and point out any difference between his use and application of the "perforated plate" referred to in his patent, and that of the above, as claimed by the patent of 1839. It is only necessary to add, that the public may apply these perforated plates either at *the door* or *bridge end* of their furnaces, without any reference to

Prideaux, Woodcock, Bayliss, or others, or being subject to their exactions.

I am, Sir, yours, &c.,

C. W. Williams.

Liverpool, January 13, 1855.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

Sir.—Mr. Williams having noticed the Cerberus allegation, I cannot do less than join my own disclaimer of having the slightest trace of knowledge who "Engineer" is. Mr. Williams I have never seen in my life and know nothing about him, except from his publications and by hearsay. Seeking information for my own use, I have found in his works a clear and comprehensive account of the process and requisites of combustion which I do not know where I can meet with anywhere else; and noticing the excessive minutiæ of Mr. Mansfield's letter contradictory to themselves, for want of being reduced within a sound principle, I thought it was a service both to himself and his *protégé* to point out my own sources of knowledge. A man who has discovered a pure spring, and does not take the trouble to indicate it to those around him who are drinking puddle, only deserves to exchange his lot for theirs. My absolute disconnection with Mr. Williams is evinced by the fact, that he does not even know my signature to be that of the same person who, immediately I saw the last edition of his work, forthwith pointed out the same day to my patent agent, well known to Mr. Williams, a most important mistake which had crept in, on a subject in which I have no other interest than that which dictates Mr. Williams's present correspondence—a desire for truth and justice to prevail upon a question of immense practical value, which I have publicly discussed. Now as I was promised this error should be corrected with a publicity equal to the oversight, and I am not aware it has yet been done, it would be just as reasonable to say I was in a state of "feud" as a state of "league" with Mr. Williams.

As there is no more effectual way of promoting truth than by correcting error, I beg to refer to a late instance of the prevailing misconception as to the "consumption of smoke," fostered, as it undoubtedly has been, by the ambiguous views enunciated by the great Watt, at a time when the comparatively undeveloped state of chemical science rendered some amount of inaccuracy almost unavoidable. The deficiencies of great authorities we must supply by the further lights obtained since their day, and which they would themselves be the very first to do if living. No one is likely to doubt that the *Times* commands, in its *writers, selected* samples of the general talent and information of the kingdom, yet in a long article on the smoke nuisance, it was lately stated that the process of Juckes, Haseldine, Hall, and other grate patentees, is to supply a thin stratum of coal *underneath the hot fuel*, through which, in consequence, the smoke passes up and *is consumed;* being the very reverse of the facts and principles of the cases, and an excellent method of *making smoke*, as may be readily proved even in a parlour fire. I am, Sir, yours, &c.,

David Mushet.

January 15, 1855.

PERMANENT WAYS.

To the Editor of the Mechanics' Magazine.

Sir,—Your able remarks on the Permanent Way Company, in your number of the 9th instant, induce me to trouble you with a few lines on the subject. Every one must agree with you, that if the company is established for the purpose of "buying up all old patents, and by united efforts opposing all new inventions," it is a very serious evil, and one materially affecting the interests of the public at large. I believe *it is* formed for that purpose, and will give you my reasons. To my certain knowledge the patent of L. D. B. Gordon was worthless, in a pecuniary sense, and never produced the patentee one farthing until one fine morning he awoke, and, to his great astonishment, he found it in requisition by the Permanent Way Company. Then let us proceed to two other directors, viz., Mr. Bruff and Mr. Robert Richardson. Many years ago, I forget the date, Mr. Richardson was employed under Mr. Bruff as resident or assistant engineer on one of the Eastern Counties lines of railway, in which capacity he had to superintend the erection of a wooden railway bridge, when, for the first time, Mr. Bruff employed the fish-jointed rail. After the railway was opened to the public, Mr. Richardson took out a patent for a great variety of improvements in carriages, locomotives, &c., and permanent ways, &c.; and amongst other things the very identical fish-joint used and published almost a year before by Mr. Bruff. This was the only thing of any use in the whole patent, and on the formation of the Permanent Way Company, became its property. This state of things did not exactly meet the views of Mr. Bruff, who rather fancied that as he was the inventor of this improvement (although not the patentee), he had a right to some pecuniary advantage from its adoption; and so well founded were his claims, that the company thought better to keep the thing quiet, by giving him a share in their profits, than to go to trial. The public have therefore to pay the company for the use of this improvement,

although the patent is granted to a gentleman who took out his patent about twelve months after it became public property, for an invention which is not his; and to keep the thing quiet Mr. Bruff becomes one of the directors.

I am, Sir, yours, &c.

Z.

ELECTRIC TELEGRAPHS.

ANOTHER MODERN ANTIQUE.

To the Editor of the Mechanics' Magazine.

Sir,—Sundry paragraphs have been going the round of the papers within the last twelve months, relating to a wonderful discovery of a Mr. Lindsay, of Dundee, which, if I mistake not, has been heralded not a little by Sir D. Brewster, by way of stamping the fact of the discovery. All this would really amount to nothing were it not that I perceive by your Journal of December 30, No. 1638, that this discovery, for some purpose or other, is carried the length and made the subject of a patent. In the abstract of patents of that date, I see that such has been granted to Mr. James Bowman Lindsay, of Dundee, bearing date June 5, 1854, No. 1242. Supposing at this time of day, no one would be so silly as to throw away their money in patenting what, to all versant in electro-telegraphic experiments, was a well-known and established fact, I thought *à fortiori* that there must or might be some peculiar novelty in Mr. Lindsay's discovery; I therefore went to the Patent office to peruse this specification, and besides finding myself sold, I find the patented description similar, and the diagram almost a copy, of what you will find at pages 60 and 61 of a little volume published by Lea and Blanchard, Philadelphia, 1847, and edited by Mr. Alfred Vail, where a much fuller description of the experiment is given, under the heading, "Mode of crossing broad rivers and other bodies of water without wires;" to which are appended the requirements necessary to carry it out, with the results and data of several experiments made by Professor Morse, December 16th, 1842; also explanations showing that the minimum length of wire required sideways along the banks of the body of water must be six times greater than the distance across; making it as a question of cost, quite unavailable, even supposing greatly extended bodies of water could be got to act similarly to these narrow rivers and canals. I trouble you with these remarks, as I have heard the crossing of the channel and the Atlantic by such a process seriously and gravely mooted.

The fact was first discovered by two Dutch philosophers, many years ago, and it is frequently alluded to in compilations on electric telegraphs.

I am, Sir, yours, &c.,
Mercurius Caledonius.

January 13, 1855.

Sir,—At page 641 of your last volume is a notice of the specification of Mr. J. B. Lindsay, of Dundee, for "a mode of transmitting telegraphic messages by means of electricity through and across a body or bodies of water;" which *mode* is said to consist in dispensing with submerged wires, using in their stead submerged balls, plates, or tubes, attached to the ends of the wires!

It is just possible that the learned Dominie may be able to sustain his claim to the monopoly of *balls* and *tubes* for this purpose, if they can be advantageously employed. But his claim to the *plate* is most assuredly dished by the public use of them in 1841, by Mr. Alexander Bain, who "found that if the mere ends of the wire were dipped into the water, the current that passed was so feeble, that if he had stopped here, it would be applicable to no practical use." He then saw that it was "NECESSARY to attach a few feet of *metallic surface to be immersed at each end of the conducting wire.* The result was, that the whole current of the small battery employed immediately passed as freely through the water as it would have done through an entire metallic circuit. The success of that experiment obviously led Mr. Bain to his great discovery of plunging, in a similar manner, plates of positive and negative metallic surfaces in the earth, or in the water, at great distances; then, connecting these by a well-regulated wire, he is enabled to discard galvanic batteries altogether, and to produce an (almost) everlasting and unvarying flow of electricity, proportionate in power to the amount of metallic surface." * Will any gentleman think it worth while to patent the latter discovery?

I am, Sir, yours respectfully,
Wm. Baddeley.

13, Angell-terrace, Islington, Jan. 11, 1855.

PORTABLE CANNON.

To the Editor of the Mechanics' Magazine.

Sir,—From a paragraph in last week's papers, I learn that, "the Minister of War has had his attention drawn to a novel description of siege cannon, the invention of a Mr. Williams, of Pembroke. The great difficulty experienced at Sebastopol is the enormous labour required to get the siege

* *Mech. Mag.*, vol. xxxix., p. 76.

pieces in position; the cannon of Mr. Williams can be carried with ease on men's shoulders, they being cast in pieces which can be fitted together in a few minutes by a person of the commonest understanding."

Some of your "constant readers from the first," may perhaps remember a similar invention (or, at any rate, an invention for a similar purpose) described by me in your pages, upwards of fifteen years ago, as the invention of Mr. Penny.*

In a succeeding number† the late Colonel Macerone, while admitting the ingenuity of the contrivance, expressed an unfavourable opinion practically, of duplex pieces of ordnance. Although the Colonel's opinion on such matters was entitled to great consideration, I could not agree with him in his view of Mr. Penny's cannon, which I still believe to be the embryo, at least, of some important improvements in the construction and application of heavy ordnance. That siege guns can be so subdivided as to be "carried on men's shoulders," is by no means probable.

If the weight can be divided into two nearly equal parts, and the gun thus become capable of use, either as a *cannon* or a *mortar* at pleasure, the importance of the improvement can hardly be overrated. Perhaps the description in your 30th volume, may just now be worth a reperusal; to the late Mr. Penny must be conceded the merit of the invention.

I am, Sir, yours respectfully,
WM. BADDELEY.

13, Angell-terrace, Islington, Jan. 9, 1855.

IMPROVED CANNON.

To the Editor of the Mechanics' Magazine.

SIR,—There appear to be many and varied opinions relative to the merits of cast and wrought-iron cannons, the leading features of each being, I think, the following:—Cast iron possess great hardness in their material, but are subject to the great drawback of their extreme liability to burst. Wrought iron, on the other hand, have the advantage of great tenacity in their particles, and perfect safety even with the use of much more explosive matter, which is equivalent to greatly increased force and power; these latter, however, from their expansion, are in a short time useless. We are thus left in considerable uncertainty which to employ.

It will readily be admitted that it would be far better if we could dispense with these life-destroying machines; but as we cannot, it is well to make them as efficient as possible. I would, therefore, propose that the cannon should be made of a comparatively thin cast material, and *encased* in a very accurately and strongly-wrought covering, such covering being affixed by means of screws and nuts, or by collars or rings driven on in the same manner as railway-wheels are to their axle-trees.

I have thought that by this mode of construction, the advantages of both could be made available, without the evils of either. I should be glad of the insertion of this in your Journal.

I am, Sir, yours, &c.,
JOSEPH CLARKE.

London, January 16, 1855.

ON ORDNANCE AND GUNPOWDER.

To the Editor of the Mechanics' Magazine.

SIR,—In a letter, headed as above, and signed "J. F." in your last number, I observe a curious argument is employed which deserves pointing out. "J. F.," in speaking of exploding mixed gases, says, "One thing is obvious, however, that some other conditions are necessary beside the generation of heat;" and in support of this statement, brings forward the fact, that a piece of wire gauze interposed between a gasometer of oxygen and hydrogen, and a burner, prevents the firing of the mixture when flame is applied. I think this illustration is an unfortunate one for the argument, for the non-explosion depends, or is universally said to depend, upon the *cooling* effects of the wire gauze, and upon these alone.

I am, Sir, yours, &c.,
ARGUS.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

GARRETT, RICHARD, jun., of Leiston Works, near Saxmundham, Suffolk, engineer. *An improved arrangement of valves for working steam expansively.* Patent dated June 23, 1854. (No. 1391.)

This invention relates chiefly to a mode of facilitating the starting of steam-engines which are arranged to work expansively, and to a mode of actuating the valve which is employed to cut off the supply of steam to the valve-chest at any required portion of the stroke of the piston. We may give a full description of the apparatus hereafter.

LETCHFORD, ROBERT MICHAEL, of Whitechapel, Middlesex, match manufacturer. *A match-stand and holder for holding matches while being ignited.* Patent dated June 23, 1854. (No. 1392.)

Claims,—1. The construction of a match-

* Vide vol. xxx., p. 14.
† Ibid, p. 178.

stand, by fitting a short tube, open at both ends and throughout its length, to a base or pedestal, or by constructing a similar tube with a base or pedestal formed thereon, or by forming an equivalent aperture through a piece of metal or other suitable material. 2. The employment of a short tube, open at both ends and throughout its length, as a holder, for holding matches while being ignited.

SKELTON, THOMAS, of Plaistow, Essex, draughtsman. *An improvement in, or addition to, tillers or yokes.* Patent dated June 24, 1854. (No. 1394.)

The addition to tillers or yokes of blocks or sheaves between those on the free end or ends thereof and the rudder-head, for the purpose of taking up the slack of the steering rope or chain.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *A new or improved projectile for ordnance and small arms, and a sabot or plug to be employed therewith, which sabot or plug may also be used with other projectiles.* (A communication from W. Antrobus Holwell, of Quebec.) Patent dated June 24, 1854. (No. 1395.)

Claims.—1 A projectile of an egg form, more or less elongated, having an axial opening throughout its length, in which is fitted a double spiral vane, for the purpose of giving a motion of rotation round its axis to the projectile on its being discharged from a piece of ordnance or a small arm; also a solid projectile of the like egg form. 2. A certain sabot or plug, and the employment of the same in the formation of cartridges.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *An improved mill for grinding and pulverizing paints, and various vegetable and mineral substances.* (A communication.) Patent dated June 24, 1854. (No. 1397.)

Claim.—Forming the grinding surfaces of the muller, and of the annular concave in the bed-stone, with a radius so much greater, as compared with the semi-diameter of the muller, that an excess of material shall have space into which to pass, thereby obviating the packing or clogging between the sides of the muller and of the said groove.

DAVIES, JOSEPH, of Bristol. *Improvements in propelling vessels.* Patent dated June 24, 1854. (No. 1398.)

When a ship or vessel is to be propelled according to this invention, it is constructed with suitable channels below the water-line to receive one or more endless series of feathering float-boards, arranged so that the propelling machinery may be below the water-line of the vessel.

THOMPSON, JOHN, of Newton-le-Willows, Lancashire, sugar-refiner. *Improvements in centrifugal apparatus used in the manufacture of sugar.* Patent dated June 24, 1854. (No. 1399.)

This invention consists in constructing centrifugal apparatus with a compartment at or near the centre, and in filling the same with fibrous or other absorbent matter to absorb water or other cleansing fluid, and to part with it by the centrifugal action of the machine.

BOTTOMLEY, REUBEN, of Rochdale, Lancaster, cotton spinner; DAVID SCHOFIELD, of Oldham, same county, mechanic; and HENRY SPENCER, of Rochdale, manager. *Certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.* Patent dated June 24, 1854. (No. 1401.)

Claims.—1. The use of bars or laths of any suitable material furnished with projections or studs, either, or all, moving laterally, so as alternately to secure and release the yarns or threads. 2. The construction and use of a bar or lath of any suitable material furnished with projections or studs, and rising and falling alternately between two exterior laths or checks.

HUBNER, EMILE, of Mulhouse, France, engineer. *Improvements in machinery for preparing wool, cotton, silk waste, tow, and other fibrous materials.* Patent dated June 24, 1854. (No. 1403.)

The object of this invention is to lay the fibres of the wool, or other material, in a longitudinal direction, and to convert the material into a long fleece or lap, or into a band or sliver, in which state it is better adapted for undergoing the combing or other operations pursued in the manufacture of fibrous materials.

BAIN, ALEXANDER, of Queen's-row, Camberwell, Surrey, mechanical engineer. *Improvements in fire-arms, and the apparatus connected therewith.* Patent dated June 26, 1854. (No. 1404.)

Claims.—The construction of fire-arms with certain described moveable bridges, certain arrangements for loading a series of chambers, either simultaneously or singly, and certain means of applying a number of percussion caps simultaneously.

PALMER, WILLIAM, of Sutton-street, Clerkenwell. *Improvements in candle-lamps.* Patent dated June 26, 1854. (No. 1407.)

This invention consists in the construction of a candle-lamp suitable for burning candles on the interior, and near the roofs, of railway carriages, &c.

BEALE, CHARLES, of Leicester, hosier, and JOHN LATCHMORE of the same place, hosier. *Improvements in the manufacture of knitted shirts.* Patent dated June 26, 1854. (No. 1408.)

This invention consists in introducing

fleecy wool or cotton in the knitting needles used in manufacturing shirts, in such manner as to produce nap or fleece as the work progresses, for the purpose of affording additional warmth to the breast of the wearer.

YATES, WILLIAM, of Mary-street, Bromley, Middlesex. *Improvements in furnaces.* Patent dated June 26, 1854. (No. 1410.)

The inventor employs slides, which, in moving back, allow some of the fuel to descend, and which, on their return, force the fresh fuel, and that which is already on the bars, towards the bridge.

SMITH, ANDREW, of Princes-street, Middlesex, wire-rope manufacturer. *Improvements in the manufacture of certain kinds or descriptions of wire and other ropes and strands.* Patent dated June 27, 1854. (No. 1412.)

This invention consists in constructing machinery for forming strands for "formed ropes," telegraph, and other cables, &c., without putting "individual twist" into the wires or yarns composing the strands.

COLLETTE, CHARLES HASTINGS, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of beer.* (A communication.) Patent dated June 27, 1854. (No. 1413.)

This invention consists of methods of forcing water through malt in a closed mash-tun, of forcing water through malt in several closed mash-tuns successively, of forcing the wort through hops in a closed hop-tun, and of apparatus "for the fermentation process when applied to one fermentation-cask, and a modification of it applied to several casks."

ANTROBUS, RICHARD LEICESTER, of Birmingham, Warwick, commercial clerk. *A new or improved method of printing oil-cloth for floor and table-covers, paper-hangings, and other surfaces.* Patent dated June 27, 1854. (No. 1415.)

The inventor prints oil-cloth by means of a series of as many pairs of rolls as there are colours to be printed, these rolls being supported by and working in suitable framing. The lower roll of each pair is plain, and the upper engraved with that portion of the pattern which is to be printed in the colour to which the said roll is devoted, &c.

MORGAN, WILLIAM, of Birmingham, Warwick, manufacturer. *Improvements in machines for cutting paper, card, and mill-boards, woollens, veneers, and materials used in making paper, parts of which improvements are applicable to other machines where quick and slow motions are used, and where machinery is required to be thrown into and out of gear.* Patent dated June 27, 1854. (No. 1416.)

As we purpose giving a full description of this invention shortly, it will be sufficient for the present to state that it mainly consists in making the cutting-knife of machines for cutting paper, &c., to pass through the material to be cut in the segment of a circle or circles by means of two or more radial arms or levers placed above or below the knife, or by a combination of radial arms or levers so placed, or by other equivalent guides; in actuating the cutting-knife by one or more screws, combined with bevel-wheels and pinions so arranged as to give a return motion to the knife without reversing the driving-shaft, either at the same rate as the cut or at an increased speed, and so also that the knife may be stopped and advanced or returned at any distance from the bed; and in actuating the knife by eccentric cog-wheels, so as to obtain a slow cut and quick return.

ILES, CHARLES, of Peel-works, Birmingham, manufacturer. *Improvements in metal bedsteads.* Patent dated June 27, 1854. (No. 1417.)

This invention consists in combining and keeping together the posts and the side, head, and foot-rails of metal bedsteads, by means of improved constructions of the posts and rails, and by the metal laths and stretchers.

COLTMAN, WILLIAM, of High-street, Leicester. *Improvement in knitting-frames.* Patent dated June 27, 1854. (No. 1418.)

This invention consists in dispensing with hanging-bits, tumblers, thumb-plates, &c., and forming a groove on either side, into which a roller or truck attached to the frame enters, and is thereby guided so as to insure the correct sinking and coming forward of the frame, so that skilled labour may be dispensed with.

DE FONTAINEMOREAU, PETER ARMAND LECOMTE, of South-street, London. *Improvements in apparatus for producing aërated waters.* (A communication.) Patent dated June 27, 1854. (No. 1419.)

Claims.—1. The employment of an internal chamber made at the bottom of the apparatus, provided with a filter and moveable ball. 2. The application of India-rubber rings to the stopper, &c., for the purpose of closing the joints of the apparatus hermetically.

DE FONTAINEMOREAU, PETER ARMAND LECOMTE, of South-street, London. *Improvements in the construction of axle-boxes.* (A communication.) Patent dated June 28, 1854. (No. 1420.)

A chamber, constructed in the ordinary manner, is provided internally, and near each of its two extremities, with bearings, or circular supports, upon which the journals of the axle-tree bear without touching any other part of the oil chamber, and between these supports is a space for containing oil. This oil chamber is closed on the

outer side by a cap and nut, and to close the main chamber on the inner side, the inventor places behind the inner support two vulcanized India rubber and leather washers, and behind them another leather washer, all of which are adjusted inside the chamber by a cast iron cap and screw.

BRUNLEES, JAMES, of Manchester, Lancaster, civil engineer. *Improvements in drawbridges applicable to rail and other roadways.* Patent dated June 28, 1854. (No. 1421.)

This invention consists in so constructing the roadways of bridges that they shall be capable of being lowered below the general level, and drawn backward beneath the adjacent surface of the road.

EDWARDS, HENRY SUTHERLAND, of Cranbourne-street, Middlesex, gentleman. *Improvements in preparing textile fabrics, or materials for the purpose of their better retaining colours applied to them.* (A communication.) Patent dated June 28, 1854. (No. 1422.)

The object of this invention is to enable textile materials to retain lithographic ink, and other colouring matters of an analogous nature, or into the composition of which similar ingredients enter, and consists in passing such materials, when intended to be printed by the ordinary printing rollers, through a bath consisting of water, holding in solution alum, sulphate of zinc, protochloride of tin, caustic potash, and nitric acid, or other chemicals possessing like properties with these.

COCKSHUTT, EDMUND, of Preston, Lancaster, ironfounder. *Improvements in bungs or adjustable stopper apparatus for casks and other vessels.* Patent dated June 28, 1854. (No. 1423.)

Claim.—The application and use of bungs of any suitable material, having a screw thread formed thereon, and made to screw flush into a corresponding socket attached to a cask or other vessel.

SCHLOESSING, THEOPHILE, of Paris, France. *Improvements in the manufacture of carbonates of soda.* Patent dated June 28, 1854. (No. 1425.)

This invention consists in causing a solution of chloride of sodium to be placed in horizontal cylinders in which are mechanical agitators, and in passing into these cylinders carbonic acid and ammoniacal gases, by means of which a precipitate of bicarbonate of soda is produced. The excess of gas, which passes through the cylinders without being absorbed, is caused to pass over coke moistened with a solution of chloride of calcium and hydrochloric acid, by which it is retained. The precipitated bicarbonate of soda is separated from the containing liquid by means of a centrifugal machine, and is converted into the neutral carbonate by the roasting process, and the carbonic acid gas which escapes is used to produce a further quantity of bicarbonate in the manner already described.

JONES, JOHN GREGORY, of Roscommon-street, Liverpool, secretary and accountant to the Liverpool Collegiate Institution. *Improvements in apparatus for teaching addition.* Patent dated June 23, 1854. (No. 1426.)

"This invention has for its object a combination of parts which can be changed amongst themselves, and present different rows of figures to be added up by the pupil, the master having a key to ascertain by inspection the sum of the whole for himself."

BISSEKER, WILLIAM JOHN, of Birmingham, Warwick, manufacturer. *A new or improved method of labelling bottles and such other vessels or articles as require or may require labelling.* Patent dated June 29, 1854. (No. 1427.)

Claim.—The manufacture or construction of labels for bottles and other similar articles, of glass, or other transparent substance, such labels being shaped so as to fit the surface of the bottles or other articles, and having the inscription or device upon their back surfaces.

SPERRY, CORYDON STILLMAN, of Connecticut, United States of America. *An improved knitting machine.* (A communication.) Patent dated June 29, 1854. (No. 1428.)

Claim.—The arrangement of the needles in the plane of the endless belt instead of at right angles to it, in combination with an arrangement of the driving-pinion and the projecting joints.

MARKLAND, THOMAS, of Hyde, Chester, warp-dresser. *Certain improvements in machinery or apparatus for warping, dressing, and weaving textile materials.* Patent dated June 29, 1854. (No. 1429.)

In constructing an improved reed or wraith the inventor finely perforates two strips or bands of India-rubber, or any other elastic substance, and employs one as a top and the other as a bottom support for the wires or dents which constitute the reed. He also describes a sub-divided self-acting temple.

HUGHES, EDWARD JOSEPH, of Manchester, Lancaster. *Improvements in sewing machines.* (A communication.) Patent dated June 30, 1854. (No. 1431.)

This invention comprises an improved machine for sewing with one long thread and needle, and a hook, which hook takes the loop of the thread, after it has been taken up through the cloth and down again in another place, around a spool, or case containing the spool, from which the thread is

taken, producing a fast stitch formed by one thread only, &c. &c.

EDWARDS, JOHN, of Manchester, Lancaster, gentleman. *Improvements in railway chairs.* Patent dated June 30, 1854. (No. 1432.)

The inventor describes a great variety of forms of rail, so constructed, that the rail can be taken out without removing the chair, no keys being required.

SHEARS, DANIEL TOWERS, of Bankside, Southwark, Surrey. *Improvements in curing or separating moisture from sugar and other substances.* (A communication.) Patent dated June 30, 1854. (No. 1433.)

This invention consists in constructing the revolving vessel of a centrifugal machine in such manner that it may be caused to open when the process is complete, and that while the continued rotation shall be the means of throwing out the charge, when the vessel is again closed it shall be in a condition to receive a fresh charge.

MONZANI, WILLOUGHBY THEOBALD, of St. James's-terrace, Blue Anchor-road, Bermondsey. *Improvements in the manufacture of folding chairs, stools, and other articles used to sit or recline upon.* Patent dated June 30, 1854. (No. 1435.)

The chief object of this invention is so to arrange parts that a bedstead shall be partly constructed of the box or case in which it is packed when out of use.

THOMPSON, NATHAN, jun., of New York, United States. *Improvements in regulating the supply of steam from steam boilers.* Patent dated June 30, 1854. (No. 1436.)

In carrying out this invention a float in a steam boiler is caused to act on a throttle or other suitable valve in such manner as to close the valve as the water-level becomes low.

GRAY, HENRY GEORGE, of Commercial Wharf, Mile-end-road, Middlesex. *Improvements in preserving potatoes, roots, plants, grain, and seeds.* Patent dated June 30, 1854. (No. 1437.)

Claim.—The use of iodine in combination with sulphates or muriates for preserving potatoes, roots, &c.

M'GAFFIN, JOHN, of Liverpool, Lancaster, engineer. *Improvements in the manufacture of iron casks and cisterns.* Patent dated June 30, 1854. (No. 1438.)

This invention consists in forming iron casks or cisterns, by combining corrugated iron with frames or rims of cast iron.

SLATER, THOMAS, of Somers-place West, St. Pancras, Middlesex, optician, and JOSEPH TALL, of Crawford-street, Marylebone, in the same county, tool-maker. *Improvements in the construction of planes, and in cutting-apparatus, and in the machinery employed therein.* Patent dated June 30, 1854. (No. 1439.)

This invention consists—1. Of a peculiar construction and arrangement of machinery for cutting the parallel sides of the plane-blocks or rough blanks. 2. Of certain peculiar constructions and arrangements of self-acting machinery for mortising the angular cavity which contains the plane-iron. 3. Of an improved construction of plane-iron.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for winding threads or yarns.* (A communication.) Patent dated June 30, 1854. (No. 1440.)

This invention relates to an improved arrangement of mechanism for winding or forming the skeins or hanks of silk, cotton, linen, or woollen yarns, and consists in imparting a lateral reciprocating motion to the guides which conduct the thread to the winder.

HULME, JOSEPH, of Manchester, Lancaster, engineer. *Improvements in steam engines and in valves, parts of which improvements are applicable for diminishing friction in other engines.* Patent dated July 1, 1854. (No. 1442.)

This invention consists—1. In a new combination of parts forming a direct-action oscillating steam engine, in which the cylinder and the guide-frame of the piston-rod are made to act as a beam. 2. In working the air-pump buckets of oscillating engines from the cylinder, or from some part connected thereto. 3. In an improved combination of parts forming a compound direct-action oscillating steam engine. 4. In giving motion to anti-friction rollers by means of racks, segments, or wheels and pinions, for the purpose of preventing the slipping and consequent uneven working of such anti-friction rollers, or of the surfaces against which they act. 5. In causing a current of water or other cool fluid to pass through a chamber formed under the footstep of governor spindles or other upright shafts, for the purpose of keeping such footsteps from heating. 6. In making the spindles of mushroom or other circular valves of nearly the same diameter as the valve itself, to reduce the power required for working such valves.

HARDING, THOMAS RICHARDS, of Leeds, York, hackle and hackle-pin manufacturer. *Improvements in the manufacture of the pins of hackles, combs, and cylinders used in hackling, combing, and preparing wool, flax, and other fibrous substances, and in the mode of applying them to manufacturing purposes.* Patent dated July 1, 1854. (No. 1443.)

This invention mainly "consists in making the said pins or teeth by means of pressure applied by cylinders or other analogous mechanical contrivances provided with dies, in the surfaces of which are made grooves or

channels, so arranged that when the surfaces of the cylindrical or segmental dies are brought together, the grooves made therein will form a model or matrix for the pins."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

WILLIAMS, DAVID LLOYD, of Cannon-street, London, gentleman, and JOHN WILLIAM NEALE, of Stepney, Middlesex, engineer. *Improvements in furnaces.* Application dated June 24, 1854. (No. 1396.)

This invention consists in surrounding a furnace with a water-trough or jacket, and in the employment of short hollow bars, which communicate with the jacket at the back of the furnace, above the water-level. On the furnace becoming heated, the water in the jacket is vaporized, and steam and atmospheric air enter the back ends of the hollow bars, and travelling forward pass into the fire.

REVELL, JOHN, of Newark, Nottingham. *Improvements in horse-hoes.* Application dated June 24, 1854. (No. 1402.)

The inventor causes a number of hoes or blades to be secured to the underneath surface of a strong bar, working vertically and laterally, in bearings connected with a frame-work secured to the axles of the machine. This bar receives motion from levers or handles, and acting upon steerage wheels, through the intervention of a steerage lever connected with their axles, in such manner as to give the wheels a lateral movement corresponding to that of the hoes or blades. The hind wheels of the machine likewise move sideways, and the horse is harnessed to a rack which works on a centre in the fore part of the machine. The hoes or blades when taken out of work are supported by catches.

MANTEGUES, HENRI, of Rouen, France. *Improvements in the manufacture of boots, shoes, goloshes, or in shoe-making generally.* Application dated June 26, 1854. (No. 1405.)

The principal feature of this invention appears to consist in a method of nailing the uppers of boots, shoes, &c., to the vamps.

BROWN, JAMES, of Haddington, Scotland, plumber. *Improvements in the manufacture of metal spouts or troughs.* Application dated June 26, 1854. (No. 1406.)

This invention consists in a method of manufacturing spouts or troughs from sheets or plates of metal by means of certain described machinery.

BAKEWELL, THOMAS HILL, of Welford-road, Leicester. *Improvements in the manufacture of gloves.* Application dated June 26, 1854. (No. 1409.)

In carrying out this invention parts of the fronts of gloves which come to the palms of the hands have let into them vulcanized India rubber or elastic fabric, and ventilators, consisting of two perforated plates or discs.

BRINDLEY, WILLIAM, junior, of Moorgate-street, London, general trader. *Improvements in the construction of life-boats.* Application dated June 27, 1854. (No. 1411.)

This invention mainly consists in forming boats with a perforated bottom, and a keel about a quarter of the depth of the boat, having a semi-circular sheet of metal fixed upon it longitudinally to stiffen the boat when necessary.

MORISON, JAMES, of Paisley, Renfrew, machinist. *Improvements in the treatment or manufacture of ornamental fabrics.* Application dated June 28, 1854. (No. 1424.)

This invention relates to that part of the manufacture of fabrics of the lappet class, wherein portions of the surface-threads are cut from the piece to bring it to the finished state. This cutting away of the threads is effected by means of a number of cutting-blades, carried spirally or otherwise upon a cylinder revolving in contact with a series of stationary tapered blades.

SMITH, WILLIAM, and WILLIAM BRAMWELL HAYES, both of Manchester, Lancaster, manufacturers. *Certain improvements in power-looms for weaving.* Application dated June 29, 1854. (No. 1430.)

This invention consists in stopping the loom without concussion, by means of an extra pulley or wheel on the driving or crank shaft of the loom, this pulley being furnished on its rim with a tooth or stop-piece.

IZART, LAURENT FURCY, manufacturer, of France. *A new mode of removing organic vegetable substances from woollen fabrics.* Application dated June 30,1854. (No.1434.)

This invention consists in applying hydrochloric acid, in a liquid or gaseous state, to any kind of woollen fabrics, to remove the cotton or other organic vegetable substance contained in them in order to render the materials fit for being re-manufactured.

JONES, ROBERT LEWIS, of Chester, railway manager. *Improvements in locks and keys.* Application dated July 1, 1854. (No. 1441.)

The inventor constructs locks and the keys belonging to them in such manner that when the key is inserted, and its handle turned round in the ordinary manner, the key is separated into two portions, one of which enters a chamber or box, while the other part, which includes the stem and handle of the key, turns round in the ordinary manner.

*** The documents of No. 1400 are with the Law Officers, under second reference.

PROVISIONAL PROTECTIONS.

Dated December 16, 1854.

2656. David D. Deming, of New York, United States of America. A machine for cutting cloth or other material used in the manufacture of all kinds of wearing apparel, and also for cutting all other articles of an uniform thickness, and which are required to be of any particular pattern, and for whatever purpose intended, and by which they may be cut with perfect accuracy, and with almost inconceivable rapidity.

Dated December 22, 1854.

2701. Louis Joseph Frédéric Margueritte, chemist, of Paris, France. Improvements in the manufacture of caustic and carbonated potash and soda.

2703. Alfred Suter, of Fenchurch-street, London. A wind guard to cure smoky chimneys or ventilate rooms or buildings.

2705. Frederic Prince, of Haverstock Hill, Middlesex. Certain improvements in the nipples of fire-arms.

2707. Edward Loysel, of Rue de Grétry, Paris, France, civil engineer. A new game combining chance and skill, and the apparatus to be used therewith.

2709. John Downie, of Glasgow, Lanark, North Britain, engineer. Improvements in fire-arms.

2711. Auguste Edouard Loradoux Bellford, of Castle-street, London. A new and useful improvement in breech-loading fire-arms. A communication.

Dated December 23, 1854.

2713. James Walker, of Wolverhampton, Stanford, brick-manufacturer. Certain improvements in machinery for the manufacture of bricks, tiles, pipes, and other articles made of clay.

2715. George Anderson of the Gas-works, Rotherhithe, Surrey, gas engineer. Improvements in purifying sewers and buildings, or other places of noxious vapours.

Dated December 26, 1854.

2720. Adolphus Dormoy, ironmonger, of Seuillon, near Langres, France. The manufacture of shovels in iron.

2721. Charles Edward White, of Fulham, Middlesex, gentleman, and Francis Robinson, of Putney, Surrey, gentleman. Improvements in signalling for railway purposes.

2722. Benjamin Bishop and Joseph Dyer, of Birmingham, Warwick. Improvements in the manufacture of hinges.

2724. Frederick Samson Thomas, of Hooks Villa, Fulham, Middlesex, and William Evans Tilley, of Kirby-street, Holborn, Middlesex. An improved process for plating or coating lead, iron, or other metals with tin, nickel, or alumina.

Dated December 27, 1854.

2725. James Dundas, of Dundas Castle, Linlithgow, North Britain, engin er. Improvements in the manufacture of cannon and ordnance of every description.

2726. John Nash, of Market Rasen, Lincolnshire. Improvements in the means or process of drying malt, grain, or roots.

2727. George Carter, of Lombard-street, London, gentleman, and Henry Cyrus Symons, of Castle-street, S uthwark, Surrey, engineer. Improvements in boilers and furnaces, and in the apparatus for supplying and regulating the fuel, air, water, and steam.

2728. Thomas Boyle, of Skinner-street, Snow Hill, London. Improvements in reflectors for artificial light.

2729. John Lang Dunn, of Glasgow, Lanark, manufacturing chemist. Improvements in working up certain waste sulphates and nitrates, and for the manufacture of useful products therefrom.

2730. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improvements in looms for weaving. A communication.

2731. John Comstock, of New London, Connecticut, United States of America. Improvements in trip-hammers.

2732. The Honourable James Sinclair, commonly called Lord Berriedale, of Hill-street, Middlesex. Improvements in machinery or apparatus for washing cloth or yarns.

2733. John Cumming, of Glasgow, Lanark, North Britain, pattern-designer. Improvements in the treatment or manufacture of ornamental fabrics.

Dated December 28, 1854.

2734. Charles May, of Great George-street, Westminster, civil engineer. Improvements in the manufacture of screws.

2736. John Cockcroft, of New Accrington, Lancaster, machine-printer. Improvements in machinery or apparatus for printing woven or textile fabrics and yarns.

2740. William Ward, of Sheffield, York, lead-chaser. Improvements in stoves.

Dated December 30, 1854.

2754. Charles Bissell, of Birmingham, Warwick, gun and pistol manufacturer. Improvements in sights for rifles and other fire-arms.

2756. Eugene Mayeur, of Tredegar-square, London, agent for Thomas Piatti, of Port Maurice, in the Sardinian States. A new hydraulic pump or machine, based on the centrifugal principle, for the purpose of raising, forcing, or exhausting (even muddy) waters or other fluids, and applicable to the wants of agriculture, industry generally, and to the salvage of ships. A communication by the said Thomas Piatti.

2760. Robert Sam North, of Gorton, near Manchester, Lancaster, engineer. Improvements in switches and crossings for railways.

2762. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in obtaining motive power. A communication from Jacques Eugene Armengaud, of Paris, France, civil engineer.

Dated January 1, 1855.

2. Walter William Lewis, of Hanley Castle, Worcester, gentleman. An improvement in the manufacture of charcoal.

4. George Cram, of Chester, iron ship-builder, and John Jackson Crane, of the same place, painter. An improved composition applicable to the coating of ships' bottoms, and other useful purposes.

Dated January 2, 1855.

6. Bashley Britten, of Annerley, Surrey, gentleman. A cheap and convenient method and apparatus for obtaining a copy of writings, drawings, or tracings in ink.

8. Henri Louis Dormoy, merchant, of Paris, French empire. Certain improvements in manufacturing and twisting silk, cotton, wool, and other fibrous substances. A communication.

10. Claude Jules Fincken, glass-merchant, of Rue de l'Echiquier, Paris, France. Preserving, without loss of heat, all windows, glass roofs, false roofs, &c., from the effects of condensation and damp, and also from the effects of external smoke, soot, and dust.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 16th, 1855.*)

1958. John Jones. Improvements in metal dinner and dessert forks.

1960. Tony Petitjean. An improved process for re-cutting or re-forming the faces of files.

1963. William Prior Sharp and William Weild. Improvements in the production of raw and thrown silk, and in machinery and apparatus to be used for the purpose.

1966. Julian Bernard. Improvements in the manufacture of boots and shoes, or other coverings for the feet.

1974. Thomas Clowes. Improvements in muzzles for horses, or apparatus to prevent horses from biting or sucking their cribs or mangers.

1977. Edward Palmer. Improvements in propelling vessels.

1981. John Chillcott Purnelle. Improvements in obtaining and applying motive power.

1982. Martin Billing. Improvements in manufacturing and ornamenting castors for furniture.

1996. Charles Frederick Stansbury. Improved machinery for making screws. A communication.

1997. Charles Frederick Stansbury. Machinery for making lock springs. A communication.

1998. Charles Frederick Stansbury. Improvements in punches and dies. A communication.

2039. Jean Antoine Passet. Improved machinery or apparatus for pressing or calendering fabrics.

2041. William Hodson. Improvements in apparatus for the manufacture of bricks, tiles, and other articles, from plastic materials.

2050. Thomas Garnett. Improvements in steam engine and other governors.

2057. Georges Danré. Certain improvements in gas-burners.

2094. Walter Sneath. An improvement in sewing-machines.

2120. John Jeyes. An improvement in the manufacture of paper, threads, and yarns.

2154. Robert Way Uren. Improvements in machinery for the manufacture of bricks and tiles.

2158. William Johnson. Improvements in windlasses. A communication.

2168. George Wigzell Knocker. Improvements in obtaining motive power by means of water.

2186. François Alexandre Nicolas Delsarte. A new mode of, and apparatus for, tuning pianos and other kinds of stringed instruments.

2222. Jacob Dockray. Certain improvements in machinery for raising woollen cloth.

2236 Samuel Mason and William Beeby. Certain improvements in the manufacture of coverings for the human leg and foot.

2558. Augustus Thomas John Bullock. An improved raft or apparatus for saving life at sea.

2583. Thomas Brown. Improvements in machinery or apparatus for cutting velvets or other similar piled fabrics.

2638. James Rose. An improvement in constructing the fire-boxes of steam boilers.

2646. Edward Strong. Improvements in removing and replacing the wheels and axles of locomotive engines and other rolling stock of railways.

2684. William Milner. Improvements in safes and other such depositories, and further improvements in the locks of the same.

2694. Henry Render. Improvements in the manufacture of night-lights.

2709. John Downie. Improvements in fire-arms.

2718. Charles Henfrey. Improvements in the construction of railways for steep gradients, and in the machinery or apparatus employed therein or connected therewith. A communication from Signor Pasquale Delorenzi, of Turin, Sardinia.

2726. John Nash. Improvements in the means or process of drying malt, grain, or roots.

2730. William Edward Newton. Improvements in looms for weaving. A communication.

2733. John Cumming. Improvements in the treatment or manufacture of ornamental fabrics.

2740. William Ward. Improvements in stoves.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

PRIVY COUNCIL APPOINTMENTS.

The Judicial Committee of the Privy Council have appointed Thursday, 1st February, at half-past 10, A.M., for the hearing of the petition of George Shillibeer, coach-builder, formerly of Melton-street, Euston-square, but now of Commercial-place, St. Luke, Middlesex, for a prolongation of the letters patent granted to him for "improvements in the construction of hearses, mourning, and other carriages." 20th September, 1841.

The Judicial Committee of the Privy Council have appointed Saturday, February 10th, at half-past ten, A.M., for the hearing of the petition of Thomas Clark, Professor of Chemistry in Marischal College, University of Aberdeen, for a prolongation of the patent granted to him for "a new mode of rendering certain waters (the water of the Thames being among the number) less impure and less hard for the supply and use of manufactories, villages, towns, and cities," 8th March, 1841.

WEEKLY LIST OF PATENTS.

Sealed January 12, 1855.

1531. William Armand Gilbee.
1537. Thomas Bennett Foulkes.
1541. John Hackett.
1559. John Ashworth.
1565. John Bailey Denton.
1567. George North.
1568. William Warcup.
1580. William Beckett Johnson.
1587. William Ball.
1592. Jean Barthelemy Gillet.
1595. Francis Whitehead and William Whitehead.
1606. Nicholas Callan.
1608. Richard Archibald Brooman.
1609. James Sedgwick.
1639. William Church and Samuel Aspinall Goddard.
1657. Samuel Frankham.
1680. Edwyn John Jeffery Dixon.
1741. William White.
1808. Thomas Webster Rammell.
1835. William Henry Smith, Henry Bessemer and Robert Longsdon
1894. Pierre Amable de Saint Simon Sicard.
2181. William White.
2183. Ancel Alexander Routledge.
2295. Jabez Morgan.
2310. Thomas Frederick Tyerman.
2329. Henry Walmsley and John Day.
2335. James Atherton and John Kinlock.
2344. Frederic Ramford Ensor.
2358. John Bird.
2359. William Beardmore.
2367. Allan McDonald and Alexander McIntosh.
2375. David Ferrier.

2380. George Tomlinson Bousfield.
2421. Alfred Vincent Newton.
2435. Joseph Wilson.
2443. George Tomlinson Bousfield.

Sealed January 16, 1855.

1583. Samuel Mitchell.
1586. James Longley.
1596. John Hackett.
1614. Thomas Firth and John Wilson.
1616. William Septimus Losh.
1634. Henry Stephens Garland and Josiah Glasson.
1658. Barton H. Jenks.
1666. Francis Morton.
1670. Robert John Keen.
1692. Christopher Ridout Read.
1698. James Griffiths.
1752. Edward Monson.
1824. Joseph Barrows.
2256. John Maddox, Edward Gardner and George Dyer Green.
2350. Louis Napoleon Langlois.
2356. Edward Simons.
2372. Charles Dalrymple Cranstoun.
2382. Henry William Harman.
2406. Adolphe Pécoul.
2432. William Hann.
2446. Henry Robert Ramsbotham and William Brown.
2474. George Collier.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166 Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co. Dublin; W. C. Campbell and Co., Hamburg.

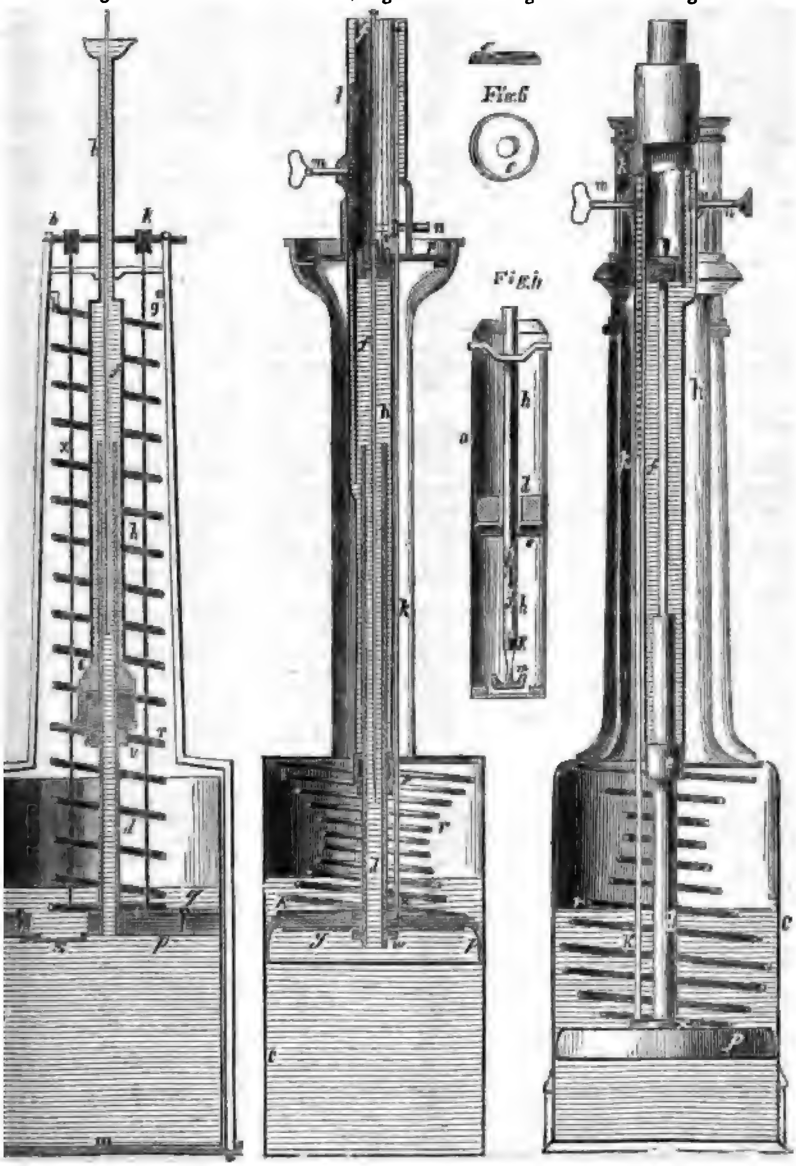
Mechanics' Magazine.

No. 1642.] SATURDAY, JANUARY 27, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

THE MODERATOR LAMP.

Fig. 1. Fig. 2. Fig. 5. Fig. 3.



THE MODERATOR LAMP.

THE French *lampe à modérateur*, now well known both in France and in this country, has been pronounced by the *Académié des Sciences* to be the invention of M. Franchot, to whom the Academy has awarded a prize in recognition of its merits. In laying before our readers a short account of this very useful invention, we shall avail ourselves of an interesting paper upon the subject which appeared in the eighth volume of *Le Génie Industriel.*

Before proceeding, however, with this account, we may remark that the real value of the moderator lamp is not generally known in this country, in consequence of a very common practice which prevails among our oilmen, of adulterating the lamp oils vended by them with oils of inferior and unsuitable qualities. We are informed, on good authority, that this practice, of mixing oils ill adapted to purposes of illumination with the illuminating oils, is so general, that but few persons are now aware of the degree of light which may be obtained from the flame of an oil-burning lamp. We gladly avail ourselves of an opportunity of taking what we trust will prove the first step towards a beneficial change in this matter.

Fig. 1 of the engravings on the preceding page represents the first design of a moderator lamp, made by M. Franchot, in December, 1835. This lamp is composed of a cylindrical vessel, *c*, mounted on a base, *m*, and open at its upper part. To the base, *m*, are fixed the supports, *a*, *b*, which carry the upper part of the apparatus. In the vessel, *c*, is fitted a piston, *p*, formed of several discs of leather compressed between two metal discs, by means of screws and nuts, *q*. A leather valve, *s*, opening downwards, is fitted to the piston, to allow the oil to pass below the latter when it is raised. The piston, *p*, carries at its centre a tubular rod, *d*, which slides in a box packed with leather compressed by means of a screw. The box, *e*, is surmounted with a tube, *h*, in which the oil ascends, and in this tube is an iron wire regulator, *f*, which also enters the tube, *d*. "By varying the length and thickness of this wire," says the inventor, in a note which accompanies his original drawing, "a regular flow may be produced from the top of the tube, *h*." A box spring, *r*, presses constantly on the piston, being fixed at *g*, at the upper part of the lamp. "By arranging holes through the supports at different heights," says the inventor, "the heights of the points of support of the spring may be varied, and, consequently, the power of the spring." For raising the piston he employed a sort of small axle, *k*, on which he wound a piece of catgut, the lower end of which was connected to the piston.

We see here all the elements of a moderator lamp roughly brought together. The piston, *p*, being at the bottom of the reservoir, *c*, the latter is filled with oil; the piston is then raised by means of the axle, and the oil passes below through the valve, *s*. The compressed spring, *r*, then presses upon the piston and causes it to elevate the oil, through the tubes, *d* and *h*, to the burner.

It was, however, some months after the invention of the above arrangement that M. Franchot first applied for a patent for his lamp; viz. in April, 1836. His plans having been meanwhile matured, now assumed the form represented in fig. 2. "The lamp, which is the subject of this invention," said the patentee's specification, "is essentially characterized: 1. by the direct transmission of the power of the spring to the resistance opposed by the ascension of the oil to the burner; 2. by a regulator which constantly keeps this second force in equilibrium with the first. It is distinguished from other lamps principally: 1. by the absence of wheel-work, valves, and suckers; 2. by the simplicity of the motive mechanism, which is reduced to a spring and a rack." Further on he says, "for regulating the flow, which, being proportionate to the decreasing force of the spring, would be first too rapid and then too slow, a fixed iron wire is made to penetrate into the interior of the hollow rod of the piston, and retard the flow of the oil in proportion to the length of it which is made to act. If the piston is at the upper end of its stroke, the spring acts with all its force, but at the same time the iron wire penetrates as deeply as possible into the tube of the piston, and the resistance it opposes to the flow of the oil is at its maximum. The liquid gradually flowing, the piston falls proportionately, and the spring is distended, while, on the other hand, the tube of the piston is disengaged from the iron wire, being withdrawn by the piston. The first cause tending to retard the ascension of the liquid, and the second on the contrary, tending to accelerate it, the two neutralize each other, and the flow is constant. The absolute velocity is determined by the greater or less length of the iron wire." Again, "the piston is formed simply of leather stamped out, compressed and held by a nut between two discs of plate iron. It moves with but little friction, and bears closely against the sides of a strong cylinder. And it has this advantage, that it acts like a valve when drawn up, the sides of it yielding and allowing the oil to pass beneath."

Fig. 2 represents a vertical section of the lamp taken through its axis. The piston, *p*, moves in the cylindrical tube, *c*, and is held between two discs, *y*, *x*, against a collar, *z*, on the tube, *d*, by a nut, *w*. The spring is formed of a wire rolled spirally on a double fusee

and presses constantly upon the piston. Its form permits it to become flattened and reduced to double the thickness of the wire of which it is formed. The tube, *d*, passes through a stuffing-box, *e*, packed with leather, and enters a case, *h*. A regulating rod, *f*, passes up through the tube, *d*, in the direction of its axis, and through a stuffing-box, *v*. The tube, *f*, is prolonged to *f'*, to allow it to be withdrawn in case of its becoming choked. To the collar, *x*, of the piston is fixed a rack, *k*, which serves to raise the lamp by means of a pinion, *n*. The other rack, *l*, is that of the burner, and is raised by a pinion, *m*. A cross piece, *p*, is fixed to the burner, and mounted by screws on two bearings left in the interior.

On July 1, 1837, M. Franchot obtained a first certificate of addition to his patent, in which he proposed—1. To designate his lamp by the name *lamp à modérateur*; 2. To employ springs composed of three truncated cones of wire united end to end, as is the case in that shown in fig. 3.

On July 31, 1837, M. Franchot assigned his patent to M. Jac, a manufacturer of Carcel lamps, at Paris. Before this arrangement, the inventor had constructed six or seven dozen of the lamps shown in fig. 3, which very nearly resemble those represented in fig. 2; and since the same letters are applied to the former as to the latter figures, no further description is needed.

M. Jac, on the 5th of August, 1837, obtained a second certificate of addition, in which he proposed to replace the valve-piston by a piston carrying an ordinary valve. It will be seen from fig. 1 that M. Franchot had also had this idea, but had abandoned it. Subsequent experience has not justified the change made by M. Jac, and the valve-piston has been returned to, and is the only one now used in moderator lamps.

Several reasons have been alleged against the rights of M. Franchot; there are, however, says *Le Génie Industriel*, but three which appear to interfere materially with his patent. They are as follows:—1. M. Mallebouche, it has been said, patented, June 9, 1832, the spring which M. Franchot claims; 2. M. Joanne is said to have employed, in 1833, the piston of stamped leather; 3. M. Allard described, in 1827, a regulator analogous to that which M. Franchot employed in his lamp.

"Were these assertions rigorously true," says our contemporary, "we could not forget that these several very simple parts, combined for the first time by M. Franchot in his moderator lamp, constitute a lamp more practical than any before known, and consequently an useful invention."

The point of interference between Mallebouche's and Franchot's inventions appears to be confined to the springs employed by each, which certainly much resemble each other.

Figs. 4, 5, and 6 represent a lamp described by M. Joanne in a *brevet d'addition*, May 17, 1833; fig. 4 being a vertical section through its axis; fig. 5 a section of the piston; and fig. 6 a plan of it seen from beneath. The lamp is composed of a cylindrical body, *a*, in which a piston, *e*, moves freely. The piston is formed of lead, and is of sufficient weight to raise the column of oil, and to overcome its own friction. It is also furnished with a second piston, formed of softened leather, with a central opening, the edges of which project inward, and its outer edge is so formed, that the pressure of the oil expands it, and causes it to fit the cylinder accurately. A central tube, *h*, terminated below by a moveable part, *k*, fitted with a bayonet joint, passes up the lamp, and regulates the aperture, *o*, through which the oil enters the tube. The moveable piece, *k*, is formed with a square piece, *m*, on its lower part, which fits into a corresponding recess in the bottom of the lamp. This arrangement is used for opening or closing the aperture, *o*. In raising the lamp, the tube, *h*, is raised by its upper end. This tube, in rising, grasps, by means of two hooks, the bottom of the piston, and carries it with it to the top, and the oil, poured in above the piston, passes below it. The piston is then left to itself, and the tube pushed back to the position shown in the drawing; then the weight of the piston presses upon the oil, causing it to ascend the tube, *h*, through the aperture, *o*. At the interior of the tube, *h*, is placed a valve, *i*, which closes when the lamp is wound up, and opens when the piston presses downwards. The spindle of this valve carries a sponge, *j*, which comes against the valve-seat, and regulates the ascension of the oil. On a careful examination of this description, it will be seen, that although M. Joanne's arrangement of the piston is related to M. Franchot's, there is sufficient difference to show that the latter gentleman has fully developed and reduced to their simplest construction methods which the former applied only in their crude and imperfect forms, and with apparently but an imperfect appreciation of their possible effects.

In a first patent of addition, dated 25th July, 1828, to a patent obtained for a lamp at an earlier period, M. Allard replaced a sponge which he had formerly used by a capillary tube, "experience having shown, that for the same area of tube and the same pressure, the quantity of oil supplied in a given time is in an inverse proportion to the length of the tube." This is in effect the theory of M. Franchot's regulator; but M. Allard makes no

mention of any arrangement for causing the length of the capillary canal to vary with the expansion of the spring. In a fourth addition this gentleman speaks of contracting the bore of capillary tubes by the introduction of one or more metal threads, but makes no suggestion relative to the adoption of any method for the purpose of regulating the flow, as is the case in M. Franchot's lamp.

From an investigation of the whole case, *Le Génie Industriel* is of opinion that M. Franchot has a right to claim—1. The improvement of the spring by the application of the triple fusee, the spring having been already applied to lamps. 2. The valve-piston, that is, the utilisation of the flexibility of the edges of the leather piston for the passage of the oil from above to beneath the piston; also the tubular rod of the piston for the ascension of the oil. 3. The *modérateur à dégagement* which, combined with the thickness of the rod of the piston, renders the retaining-valve useless. 4. The application of the rack and pinion for raising the piston. 5. The general combination of these different parts, which, after an experience of eighteen years, has not been materially modified, this combination forming the moderator lamp, and constituting a really useful invention.

ON TUBULAR STEAM BOILERS.*

BY MR. H. WRIGHT, OF BIRMINGHAM.

STATIONARY steam boilers with tubular heating surfaces possess many advantages, and experience has brought them into notice more fully than any mere theoretical consideration could have done; at the same time it has brought to light difficulties that were not at first anticipated.

The advantages of tubular boilers are found to be—

1st. Economy in fuel, requiring from 25 to 30 per cent. less fuel for the same amount of duty than the two-flued boiler.

2nd. They are fixed and set to work with less cost and labour, not requiring any brick flues to surround them.

3rd. They can be examined and repaired with ease and facility, having no brick flues to be removed before they can be inspected.

4th. They are not injured by using dirty water, as the sediment falls to the bottom of the boiler, where there is no heat transmitted through the plates; consequently, it does not adhere to the boiler shell, but lies loose, which is not the case with boilers having brick flues round them.

5th. The heating surface is renewed with less labour and cost than the heating surface of any other kind of boiler.

6th. The shell of the boiler is more durable, not being acted upon by the fire nor by the brick-work, as are boilers with brick flues round them. Brick-work round boilers is found to do more injury than anything else; in most cases when boilers are done and worn out, it has been the brick-work alone that has caused it, in connection with a few leakages, or an accumulation of moisture, of which nothing is known until the injury is done.

7th. They will sustain a greater pressure than other boilers, the same power being obtained in less space or diameter of shell.

8th. They occupy much less space than other boilers, and are more easily moved from one place to another.

9th. They require less time to do the same amount of duty; for instance, steam is raised in about one-fourth the time that other kinds of boilers require; also, in checking the production of steam, less trouble and time is expended; by shutting the dampers and opening the fire-doors, it is stopped immediately; but with boilers in brick-work, it requires considerable time to heat and cool the brick-work with which they are surrounded, which must be done before the boilers can either be put into or out of action.

Some difficulties have arisen in carrying into practical use this mode of obtaining the heating surface of steam boilers; still none have yet appeared that may not reasonably be expected to be overcome.

Some of the difficulties are found to be—

1st. In firmly attaching the tubes to the tube-plates; this arises in many instances from defect in the materials or workmanship; but it still is a fact that with all the care that has been given in making, the tubes sometimes become leaky and loose in the attachment to the tube-plates, before the tubes are properly worn out in other parts. The most effectual remedy for this appears to be, to make the end of the tubes fixed to the tube-plates much thicker than

* The above remarks on tubular steam boilers form part of a paper recently read at the Institution of Mechanical Engineers, Birmingham. They were accompanied with a description of an improved boiler invented by Mr. W. B. Johnson, of Manchester, which we shall endeavour to publish shortly.

in the body part, by which the tube ends will be able to maintain that amount of expansive force which is absolutely necessary to form a firm connection between the tubes and tube-plates.

2nd. It has been found in many cases extremely difficult to keep the interior surfaces of the tubes free from sooty deposits; this often arises from the tubes not being of proportionate diameter to their length; also, from the imperfect combustion of the gases from the furnaces, producing in such instances a great amount of smoke. This difficulty is effectually removed by making the tubes of proper proportions, and consuming the smoke before it enters into them. Some boilers made upon the arrangement shown in the engravings, have tubes only 2¼ inch diameter, which are found to work well, with cleaning out once in three or four months during constant work.

3rd. Another difficulty in some arrangements of tubular heating surface, appears to be in keeping the exterior surfaces of the tubes clean. This difficulty is not found to exist when the tubes are placed in vertical rows, leaving a clear vertical space between them from the top to the bottom row. But when the tubes are arranged in diagonal rows, where each tube comes just under the spaces of the row above, this difficulty becomes of serious import, particularly where the water contains materials liable to deposit, the scale from one row of tubes falling upon the tubes below, and thus the spaces between the tubes are liable to become choked up, and the tubes are rendered useless as heating surface.

Tubular heating surface in steam boilers has the advantage, that the heat is brought into contact with no other surfaces but those that are surrounded by the water intended to be converted into steam. The heat is also divided into a considerable number of small streams or currents. Each stream or current of heat is exposed to a considerably larger amount of surface in proportion to its quantity than can possibly be obtained by any other mode; and a large amount of heating surface can be obtained without causing the heat to travel an objectionable distance from the place of its production. The desirableness of heat acting upon surfaces only in contact with the water to be converted into steam is evident; and in no other construction of heating surface is this so fully obtained as in the tubular.

The heat being divided into a number of small streams according to the number of tubes, facilitates its transfer to the water with which each stream is surrounded; the heat is, in fact, sifted through the water by passing through the tubes.

In the comparison of a tube 3 inches diameter inside, and flue of 24 inches diameter inside, the capacities of the tube and flue for the heating vapour being in proportion to their cross sectional areas, will be as 7 to 452 square inches; therefore, the 24-inch flue will carry 64 times as much of the vapour containing the heat as the 3-inch tube. The surfaces, or circumferences of the tube and flue are 9½ inches, and 75½ inches respectively, or the surface of the flue is 8 times that of the tube; consequently, the tubular heating surface in this example has an advantage of 7 to 1 over the flue heating surface, supposing that both are supplied with an amount of heat in proportion to their respective cross sectional areas.

Tubular heating surface is obtainable within a much less distance from the furnace than any other kind, an advantage of no small importance, when it is considered how much cleaner the surface thus placed is kept by its proximity to the furnace; and the heating surface is thus made more effective. The further the heating surface is from the furnace, the greater is the amount of deposit upon it; as is well known from experience in the use of boilers of the ordinary construction.

An important principle, applying to all kinds of heating surface, appears to a great extent to have been overlooked in the first constructed tubular boilers; namely, that the vapour containing the heat should pass slowly over the heating surface, and also that the vapour should pass evenly over the heating surface.

That the vapour containing the heat to be transferred may be carried too quickly over the heating surface, may be illustrated by passing the finger through a flame. If it is passed through the flame quickly, say at a speed of 10 feet per second, scarcely any perceptible heat will be transferred from the flame to the finger, and the transfer of heat increases as the speed is reduced.

Supposing a steam boiler required 100 square feet of heating surface on the tubular construction, if long tubes were used, this surface would be obtained by taking eight tubes 16 feet long, and 3 inches internal diameter; but with short tubes, it would be obtained by using sixteen tubes 8 feet long, of the same diameter.

The vapour containing the heat to be transferred, in passing over the heating surface formed by the long tubes, will travel at double the velocity that it will in passing over the surface formed by the short tubes; or the vapour will pass through the long tubes in the same period of time as through the short ones, and consequently travel at double speed.

The slow passage of the heated vapour

over the heating surface appears still further important, when it is considered that atoms of heat, in being transferred from the vapour to the heating surface, move in directions at right angles with the current of the vapour. The vapour, when travelling with rapidity, has a tendency to carry the heat along with it; and it might, perhaps, be possible to convey vapour containing a considerable amount of heat so rapidly over a surface as that no perceptible heat should be transferred.

Considerable difficulty in many steam boilers having tubular heating surface has arisen in evenly distributing the heat; one part of the heating surface having more heat transferred to it than another part, some of the tubes receive a larger amount of vapour from the furnace than others. This is objectionable, in as much as the duty of the steam boiler is diminished thereby; a part of the heating surface not being in proper action, must of necessity reduce the amount of duty performed by the boiler.

The most successful mode of combating the difficulties is, so to arrange the position of the furnaces relative to the tubes, and of the draft from the tubes to the chimney, as that the tubes shall be all equally disposed to receive the vapour as it comes from the furnaces.

THE CALORIC ENGINE.

Mr. Ewbank's papers on the caloric engine, the principal of which we published in our Number for October 28th, 1854, have been replied to in the November Number of the *Journal of the Franklin Institute*, by Mr. Bloodgood, and by Captain Ericsson himself. The former gentleman, after contending that if the facts arrived at by experiments with the caloric engine could not be reconciled with the received theories of heat, the latter, and not the former, must give way, proceeds thus:—"But is it the fact that the principles of this engine are at variance with received theories? Mr. Ewbank states that Captain Ericsson and his friends claim that, 'But for practical difficulties and imperfections attending the construction of a new class of machines, the *whole* heat might be saved from running to waste. I have known Capt. E. personally, and have often talked with him upon this subject, but have never heard him claim this much; on the contrary, he *positively and most emphatically disclaims* any such idea. What his friends claim, may arise from their misapprehension, but certainly not from his own assertions. He has never, to my knowledge, claimed to retain for future use, *any heat* but that which *has not been expended* in useful effect (or whose force has not been transferred to matter outside the engine.)"

Mr. Bloodgood then proceeds to state that it is that heat only which is not actually expended in producing "useful labour," which Captain Ericsson expects, or has claimed to save; and adds—"It will not, however, be out of place in this connexion to quote the words of the celebrated Regnault, certainly the highest authority on the subject of caloric now living, to wit: 'In air engines, when the motive force is produced by the dilatation which heat produces upon gas in the machine, or by the increase which it produces in its elastic force, the work done at each stroke of the piston will always be proportional to the difference of the quantities of heat in the air entering and leaving; that is to say, the loss of heat by the air in traversing the machine.' But, as in the Ericsson system, *the heat which the air gives out, is given up to bodies from which the entering air takes it again, and brings it back to the machine*, we see that, theoretically, *all the heat expended is utilized for mechanical work; whilst, in the best steam engine, the heat utilized in mechanical work is not the one-twentieth part of the heat expended.*"

In concluding his remarks, the writer says—"But to revert to our original proposition; does the return of heat, as illustrated above, imply a perpetual motion, as stated by Mr. Ewbank? Most certainly not; even were an engine constructed solely with reference to continued motion, without regard to any exertion of power. This plainly appears from what I have shown as the action of a 'regenerator;' for, though the saving may approach, apparently, very nearly the whole quantity of heat demanded, it certainly can never equal it, even leaving out of the consideration the effect of expansion, radiation, &c. Theoretically, it may approach infinitely near that point, but there must still be a difference.

"If my assumption as to the value of heat returned be not admissible, how then can we account for an engine being kept in motion for a long period, an hour or more, after all sources of heat except the regenerator and heated parts of the engine have been removed? and this I assert to be a fact. * * * Finally, as to the statement that the regenerator acts as a serious drag on the engine, by resisting the passage of air, I have only to say that this exists only to a very trifling degree; for in an experiment which I witnessed to test this very fact, the obstruction in passing through 250 wire discs was only sufficient to change the level of a mercury gauge about one-quarter of an inch, too inconsiderable to be

of serious moment, compared to the whole power."

Captain Ericsson's reply is as follows:

"A very learned professor of mathematics in the north of Europe recently published a pamphlet in relation to this motor, in which he clearly demonstrated that caloric cannot be made to exert an infinite amount of mechanical force. On presenting a copy of his work to an eminent engineer for his approbation, this gentleman returned civilities by presenting the professor with a printed copy of the claims of the inventor, under which several European patents had been granted. The *savant* was much mortified to learn by the document thus presented to him, that he had wasted time by disproving a proposition not advanced. This is only one instance out of hundreds that might be cited of uncalled-for criticism on this subject. Such misconceptions on the part of those who have only had access to newspaper statements, popular lectures, &c., are by no means surprising. That Mr. Ewbank should have fallen into a similar error is, however, unaccountable; for he, as commissioner of patents, signed a document, in which the following distinct declaration of the inventor is contained: 'Whilst in the steam engine the caloric is constantly wasted by being passed into the condenser, or by being carried off into the atmosphere, in my improved engine, the caloric is employed over and over again, enabling me to dispense with combustibles, *excepting for the purpose of restoring the heat lost by the expansion of the acting medium, and that lost by radiation*; also, for the purpose of *making good* the small deficiency *unavoidable* in the transfer and retransfer of the caloric.' In the face of so clear a statement, it is palpable injustice to attribute to the inventor the absurd proposition of producing an unlimited amount of mechanical force by caloric. Moreover, an accurate estimate of the quantity of fuel requisite to meet the several sources of loss here distinctly pointed out as inseparable from the caloric engine; viz., the loss by radiation, the loss by fall of temperature during expansion, and loss attending the process of transfer in the regenerator, will assuredly not furnish good excuse for confounding the caloric engine with the chimera of 'perpetual motion.' At the same time, it may be readily proved, that the caloric, which is thus in part wasted, and in part rendered unfit for producing motive power in this engine, calls for but a small consumption of fuel. Accordingly, the production of a given amount of power will require but a small consumption compared with the present steam engine.

"Mr. Ewbank states that heat cannot be used over again. It has been shown by the practical working of several caloric engines, that the quantity of heat contained in the air of the working cylinder is much greater than the quantity generated by the combustion in the furnaces during each stroke. The excess, therefore, must be supplied by the regenerator, which receives its caloric solely from the air escaping from the working cylinder. It would be sheer sophistry to say that this is not employing heat over again. Treating heat as motion only, and adopting corresponding language, would render the explanation of the operation of the machine quite unintelligible. Otherwise, the writer has no objection to deal with caloric as force, for his opportunities of observing its nature and effects have been most extensive, and he long ago arrived at the conclusion, that heat is motion. The superficial investigator alone, will deem this hypothesis fatal to the caloric engine. A thorough investigation of the principle of the engine will show, that (supposing *caloric* and *motion* synonymous) the proposition is not to reproduce the motion once imparted, or parted with, but simply to employ, or exhaust the whole motion, the entire force resulting from the exciting cause. How imperfectly this is accomplished in the present steam engine, needs not be pointed out, *high* and *low* temperature being alike unavailable, whilst in the caloric engine the exciting energy, the force of caloric, may be rendered available from 540° down to atmospheric temperature.

"Mr. Ewbank's practical mode of illustrating the subject by showing that 'there is no making pounds out of pennies in the currency of force,' calls for the following kindred illustration: The force of caloric being represented by a stream of water running down a declivity of a certain height, the present steam engine will be truthfully represented by a small overshot wheel placed somewhere down the stream; the caloric engine, at the same time, will be as truthfully represented by a Turbine wheel placed at the bottom, employing the force of the entire height of the fall. The wheel first mentioned has been tinkered at for half a century, and at last rendered tolerably perfect, its admirers telling us with exultation, that 'it spans the entire stream, and that not a drop can pass without doing full duty.' They forget, in their admiration, that the stream is running to waste above and below.

"The writer desires to be clearly understood to assert, that the power developed by the caloric engine demands no further consumption of fuel than that requisite to meet the several sources of loss of heat enumerated in the foregoing statement, viz: fall of

temperature by expansion of the acting medium in the working cylinder, radiation of heat, and loss attending the process of transfer of the caloric in the regenerator. The first-named loss, calculation will determine; the other two have been ascertained experimentally. The result establishes a very small consumption of fuel compared with the present steam engine. The saving is effected mainly, by using the heat over again in the regenerator, *by which*, in every instance, the air entering the working cylinder has been elevated to 400°, often as high as 500°, *before receiving any heat from the furnaces.*"

To these communications, the Editor of the *Journal* has appended the following remarks, upon which, as well as upon the papers themselves, we shall leave our readers to form their own opinions:

"We publish the remarks of Messrs. Ericsson and Bloodgood, although it is rather too late to begin to reply to the articles previously published, after the total failure of the project. Nor do we agree with the gentlemen as to the view they take of the question. Mr. Bloodgood incorrectly asserts that Mr. Ewbank's article is 'almost the only one which essays to meet the subject upon philosophical grounds, instead of by ridicule.' The ridicule which was thrown upon the project in some of the later articles which have appeared in this *Journal*, was caused by the attempts of his friends (for we considered the feasted and champagned reporters who were permitted to attend his trip, in this light), to present each successive failure as an entire success. The principle, as announced in the patent, was fairly developed and rationally discussed in former articles, to which no reply was attempted.

"We do not accuse Mr. Ericsson of having ever asserted that his engine was, in principle, a perpetual motion. But this claim was decidedly and frequently made in the various newspaper articles which reported his banquets, and for which we cannot but consider him responsible, since they were published under his auspices (on his account, as it were), and without public remonstrance on his part, so far as we have ever heard.

"The experiment we always regarded as an interesting one, and regretted the care with which all impartial and competent men were excluded from an opportunity of witnessing the trials. Now that the result has been a complete failure, it is, we imagine, useless to resume the discussion, until new features are developed in the machine, or capitalists are found ready to throw away their money on a new experiment."

ON CERTAIN EFFECTS OF INDUCED ELECTRICITY.

BY W. R. GROVE, ESQ.*

In the course of last year I observed that, by connecting the coatings of a Leyden phial with the extremities of the secondary coil of Ruhmkorff's apparatus, a great increase in the brilliancy of the discharge could be obtained. Circumstances diverted my attention from it at the time, and I did not publish the experiment, though I believe Mr. Gassiot mentioned it in one of his papers. I have since heard that M. Sinsteden in France had made the same observation, though I do not know when, nor whether he has published his experiments.

The point which I now think may be worth insertion in the *Philosophical Magazine*, is the conversion, by means of a Ruhmkorff coil, of an indefinite amount of voltaic power into static electricity. If a small Leyden phial have its coatings connected respectively with the extremities of the secondary wire of a Ruhmkorff coil (the primary being, as usual, connected with the condenser of M. Fizeau, and two wires being attached to the terminals and brought within striking distance), the noise and brilliancy of the discharges are greatly increased, with generally a slight, but a very slight, diminution in their length. If now the voltaic battery be increased, the coil and Leyden phial remaining the same, but little increase in the length or brilliancy of the sparks will ensue, that is, provided the battery was in the first instance sufficiently powerful to give the maximum effect of the coil without the phial. For instance, if with a Ruhmkorff coil of the size now usually made, 10 inches long by 4 diameter, four cells of 2 inches by 4 of the nitric acid battery be used, and a pint Leyden phial, but little increase of effect will be obtained by using eight or more cells, and the platinum at the contact breaker would be rapidly destroyed by the sparks.

But substitute for the pint Leyden phial one of double the capacity, and it will be found, that though this second phial was inferior to the first with a battery of four cells (giving shorter sparks, and fewer in a given time, though somewhat denser), yet it is far superior to the first with the battery of eight cells, and the sparks at the contact breaker are no longer injurious.

By adding more coated surface, for instance, another phial, four more cells may be added, and increased effects will be obtained, and thus with *the same coil* the bril-

* Communicated by the author to the *Philosophical Magazine* for January, 1855.

liancy of the discharge may be increased to an extent to which I have not yet found a limit. I obtained this result some months back; but not having a large battery, I did not go beyond ten cells, which I found would well bear a jar of one square foot of coated surface.

By the aid of Mr. Gassiot's more powerful apparatus I have, with him, used 30 cells of the nitric acid battery, 2 inches by 4, and 5 square feet of coated surface; the effects were very striking—a roar of voluminous discharge of 0·6 of an inch long, increased to 1·5 inch when the flame of a spirit-lamp was placed between the terminals. I have never witnessed such a torrent of electrical discharges; the noise could not be borne long without great discomfort.

With the same voltaic battery, and an additional square foot of coated surface, the effect was somewhat diminished. Mr. Gassiot had not more than 30 cells available at the time of our experiments, so that I have not yet ascertained the limit to which this increase of power can be carried. I presume, however, there is a limit, for reasons which will be presently apparent.

The following precautions are essential to the success of the experiment:

1st. The wire proceeding from the outer extremity of the secondary coil must be connected with the inside or insulated coating of the Leyden battery, if the battery is not wholly insulated. The reason of this is that the outer extremity of the coil is the better insulated portion, and also that to which electricity of tension flies off. A good spark can, under ordinary circumstances, be obtained from the outer, but scarcely any from the inner terminal of the coil.

2nd. The distance between the hammer of the contact-breaker and the soft iron core should be made as great as practicable, at least one-eighth of an inch; this is an important point as to the theory and experimental results of the Ruhmkorff coil. Time, as is well known, is necessary for the development of electro-magnetism; and M. Matteucci, in his recent valuable book on induced electricity, has shown some remarkable results flowing from this fact. If the hammer be too near the core, the former is raised before the latter has time to be fully magnetized; and when a Leyden condenser is used, further time is required for this to be charged. This demand of time indicates the probable limit to the increase of power to which I have above alluded.

It is very curious to see the *absorption*, so to speak, of voltaic power by the Leyden battery: when the maximum effect for a given Leyden jar has been passed, the contact-breaker shows by its sparks the unabsorbed induced electricity which now appears in the primary wire; an additional jar acts as a safety-valve to the contact-breaker, and utilizes the voltaic power, and so on.

It is a question of some interest why a jar charged in the ordinary way by temporary contact of the terminals of a secondary coil will only receive a very slight charge, and give a discharge of scarcely measurable length, yet when permanently connected with the terminals will give a long and powerful discharge. The following is the best theory I can offer. At the moment of the inductive action or wave of electricity, the same wire which is affected by the electric impulse is unable to conduct it back again, and thus to discharge the jar; while, when the jar is attempted to be charged in the ordinary way, the contact, however apparently of short duration, lasts longer than the single impulse of electricity, and so the coil in great part discharges the jar. Some such state of the wire as that I have suggested must exist at the moment of an induced current, as otherwise the wire would discharge itself, or, in other words, would never receive a charge or state of opposite electricity of great tension at its extremities. At one time I considered the explanation to be, that at the moment of breaking contact, a portion of the induced electricity flies off across the discharging interval in the form of a spark, and thus enables the jar to discharge itself just as the voltaic arc will pass across the path of an electric spark, though it will not pass through a measurable distance of interposed air without the spark. This theory, however, does not satisfactorily explain the great increase in the charge of the Leyden phial, as compared with the charge by contact.

3rd. It must be borne in mind that each coating of the Leyden phial must be connected with each terminal; the jar is not, as many have tried the experiment, to be interposed in the secondary circuit.

The number of discharges in a given time will depend upon the intensity of the battery, and its relation to the amount of coated surface; the eye cannot estimate this, but a rough measurement of the rapidity of succession may be made in the following way. Move across the line of discharge with a steady hand a strip of writing-paper, it will be punctured with a row of holes, which will be the more closely approximated in proportion as the succession of discharges is more rapid. By a disc of paper attached to an axis moving with a given rate of revolution, this measurement may be made very accurate and useful.

Those who possess the coil apparatus will find it very convenient to have a plate of

glass, coated on each side with tinfoil, placed on the base of the machine, and having strips leading from each coating to binding-screws, with which the terminals of the secondary coil can be connected at will.

INVESTIGATION OF THE MOON'S MOTION.

[We deem it necessary to state that the following letter was received before the opening of the late controversy in our pages on the above subject.]

To the Editor of the Mechanics' Magazine.

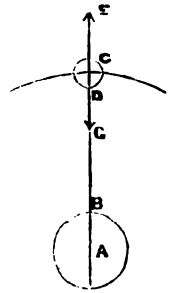
Sir,—That the moon rotates on its axis in exactly the same time as it turns round the earth can scarcely be considered as a matter of pure accident. The reality of the fact cannot be doubted; for if there existed even a very trifling difference between the times of the two motions, the corresponding differences of the motions themselves would, after centuries, certainly have accumulated to such an extent as to amount to a very sensible quantity. Astronomical hypotheses may have been made respecting the original impulse of the moon, in consequence of which it was to rotate on its axis in the same time as it revolves round the earth, in which hypotheses the influence of any other heavenly body was naturally left out of consideration. This very influence, however, would soon produce an error in the motion great enough to be noticed, as we said, after centuries.

It is therefore but reasonable to believe, since these changes in its motion are not observed, that the moon goes steadily on, revolving as it does in virtue of some law independent of its original impulse. It is the demonstration of this law that I will endeavour to give here. I shall first recall the fact, that the moon having begun to move as it does, there was, setting aside extraneous influences, no reason for its discontinuing to do so; and then, taking the foreign influences into consideration, show why the said motion is undisturbed.

Admitting that the earth and the moon are perfect and homogeneous spheres, their reciprocal attractions may be considered as acting in the line joining their centres; but the moon is, in comparison to its size, near enough to the earth to prevent our being allowed to consider the directions of the attractions, converging from its different points to the earth's centre, as parallel; and we will leave it for the present questionable whether we can speak of a centre of gravity of the moon. We shall, in the sequel, return to this point.

Let A (fig. 1) be the earth's centre; C, the moon's centre; A B, the earth's radius; C D, the moon's radius; and suppose that the circle, with radius A C, is the orbit of the moon's centre. Leaving out of the

Fig. 1.



question, for the present, the libration, we admit that the moon revolves round the earth so that the same points, A, B, D, C (which have been taken in a straight line), are constantly in a straight line, and that C moves uniformly in its orbit; and we observe that the same *dynamical phenomenon* will be produced, if we consider the moon to be at rest whilst the earth rotates uniformly on its axis, perpendicularly projected at A, so that any one of its points, B, describes a whole circumference in the same time as C did in the former motion, but in the contrary direction. Or, in our present consideration, we might express this in other words, by saying that, *in both cases, the* DYNAMICAL RELATION *of the two bodies is the same.*

We have here an opportunity of stating the following general and very important dynamical principle:

When, by different causes, two or more bodies come to have the same dynamical relation to each other, the forces which these bodies exert directly or indirectly upon each other, are exactly the same in all cases.

This principle must be understood as soon as a clear idea of relative motion, in opposition to inconceivable absolute motion, has been formed, and can require no demonstration.

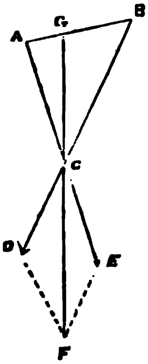
Returning to our subject, we observe that if the moon is at rest, its gravity, represented by C G, acting in the direction C D A, is independent of the earth's rotation and that therefore a force, C E, equal and directly opposite to C G, will be that which will produce the moon's stability. Therefore, according to our above principle, the already described motion of the moon round the earth will be possible under the influence of the same forces, C G, C E. The first of them will be unaltered by that

motion, and the second will be produced by giving to the centre, C, such a velocity that the centrifugal force of the moon, which has evidently always the direction, A C E, shall be equal to C E. We now perceive clearly the possibility of the moon's motion as it occurs in nature, without the necessity of admitting that it has a centre of gravity with regard to the earth.

The resultant of the attractions of the atoms of the earth on one atom of the moon, is evidently a force passing through the earth's centre.

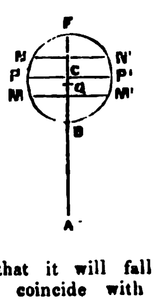
Let C D, C E (fig. 2), be two such forces acting on the points A and B of the moon.

Fig. 2.



Join A B, find the resultant C F of the two forces, C D, C E; and produce F C till it meets A B in G. We may call, analogously to the combination of parallel forces, G, the fulcrum of the forces acting on A and B. By the help of this convention, we can succeed in determining a point of the moon corresponding to the centre of gravity which it would have if the attractions from the earth centre were parallel. This point will evidently lie on the diameter D F (fig. 3) of the moon. Further, we can

Fig. 3.



demonstrate that it will fall on C D, but will not coincide with the centre, C; for if we consider two elements, M M', N N', of the moon, represented by equal circular sections, both perpendicular to A F, and on different sides of C; we see at once that the section, M M', being nearer the earth's centre A than N N', is more attracted by it than N N'. Therefore the centre of gravity of the system, M M', N N', in the new acceptation of the term, is below the point, C. If we now draw the diameter, P P', perpendicular to A F, we see that the whole of the moon can thus be divided into elements lying on both sides of P P', the centre of gravity of any pair of which is beneath C. Therefore, also the centre of gravity of the whole system of elements, or of the moon itself, lies below C.

Let Q be this point; it is easily seen that the only property it will have in common with an ordinary centre of gravity, is that the moon may revolve on its axis, D F, passing through Q, so that the position of the latter point in space is not altered. For, if we suppose any other axis drawn through Q, we see that any rotation of the moon on it will alter the distance of its centre, C, and therefore of its centre of gravity, in the new acceptation of the term, from the centre of the earth.

The rotation of the moon on an axis projected at Q, appears now impossible, so long as the distance, A Q, is to be constant; and, since this last condition is necessary for the equilibrium of the gravity and of the centrifugal force (represented at fig. 1, in the state of stability of the moon, by the constant C E), we conclude that in its stable position, the moon could not revolve on the axis projected at Q, which, according to the principle we established above, is the same as saying that the moon must revolve round the earth in the already described manner.

On the other hand, if we do not admit, even by analogy, the existence of a centre of gravity of the moon; we can conclude at once that since there is no point in the moon through which such an axis of rotation could pass, that the rotation, when once begun, could occur as a consequence of inertia, without the action of additional *external* forces: the moon can only revolve round the earth in the already described manner, unless it were to rotate on the axis, D F (fig. 3), as we have seen.

Since, then, the rotation of the moon on its axis, in the sense hitherto given to those words, appears to be a mere consequence of its revolution round the earth, and not an *independent* motion, it might be more rational not to speak of that axis and of the rotation on it at all; but to define the moon's motion, independently of the libration and of the eccentricity of the orbit, by saying that the moon revolves round the earth's centre as if it were rigidly connected to that point.

I hope, Sir, with your consent, to continue this investigation. I trust, however, I have already said enough to destroy some doubts.

I am, Sir, yours, &c.,
C. J. RECORDON.

Cambridge.

ON PERMANENT WAYS.

To the Editor of the Mechanics' Magazine.

SIR,—In the last Number of your Magazine is a letter signed "Z," to which I beg you to give me a little space to reply; as although I might well pass over an anonymous attack that came within the fair limits of criticism, I do not think it right to leave this letter unnoticed; dealing, as it does, not only in statements conveying utterly erroneous impressions, but ending in an insinuation that a member of the Permanent Way Company obtained a patent for that which he knew was another man's invention, and, consequently, that he must have made a false declaration. I think, Sir, you will allow that you have not in this instance exercised your usual editorial discretion, as it is not the proper province of such a periodical as yours, and especially one so widely circulated, to give currency to the imputation of conduct which, if proved, would exclude the party from respectable society. But to begin at the beginning of the letter:—there can be no greater mistake than to suppose "the company is established for the purpose of buying up all old patents, and by uniting efforts opposing all new inventions." This quotation is from a review of the Company's circular contained in a former number of your Magazine; and I take the liberty of saying the reverse is the fact, and the statement in the circular, that "the Company do not consider the improvement of permanent way by any means an exhausted subject; and they not only propose to add, from time to time, such further improvements as may suggest themselves to the members of this Company, but they are also desirous of promoting any useful inventions in permanent way which may be brought under their consideration by other parties," truly expresses the facts of the case.

"Z.'s" "certain knowledge" about Mr. Gordon's patent, and the inference he would have your readers draw from it, to prove the object of the Company, is quite beside the mark; some of the most intrinsically valuable patents have been "valueless in a pecuniary sense," until parties having the power to work them commercially have taken them up. Had not Watt been thrown into connection with Bolton, the probability is that he would have reaped no personal advantage from his inventions, and the public might have waited for many years for the development of the benefits that accrued to them through the union of commercial ability with inventive genius. Instances similar in principle are so numerous, that they are almost the rule rather than the exception in patents; but let us suppose that the Permanent Way Company have bought a patent that is not only valueless in a pecuniary sense, but utterly worthless: what then? They have simply thrown good money away for a bad article, which is no business of "Z.'s," or that of anybody but themselves. Certainly, the Company will not be inclined to be guided by his judgment as to the value of a patent, condemning, as he does, with one swoop, the inventions of so talented a person as Mr. W. B. Adams (the co-patentee of Mr. Richardson); but I need not defend this gentleman, as he is competent to do that himself.

I pass on to "Z.'s" assertions respecting the connection between Mr. Bruff and Mr. Richardson and the invention of the fish joint; it is to this garbled statement that I alluded in the outset. I have the authority of Mr. Richardson to utterly deny the imputation attempted to be fastened upon him by inference. "Z." mixes up the name of Mr. Bruff in a manner that must be offensive to that gentleman, who is a member, but not a director, of the Permanent Way Company, and who has contributed patents of his own to the common stock. I could easily expose the inaccuracies of the whole statement; but it would not interest your readers, and it is no concern of "Z.'s"

Allow me now to allude to an expression in your former criticism, to the effect that the Company levy "black mail" upon the railways. Unless all income derived from licences under patents is "black mail," in other words, a robbery, the stigma does not apply, but it seems to be attributed to the Company because it is an association of patentees. Now the fact is, that the Company's rates of licences are all of them *much lower* since the association than when the patents were held by individuals; and I fearlessly state, that the Company has been the means of more quickly and extensively introducing improvements in railways than if the inventions had remained in the hands of the patentees individually; that the rates of licensing have been largely reduced; that great economy has resulted to the railway companies, with increased safety and comfort in travelling to the public; and whatever success has attended the Company's operations in a pecuniary sense, it is only a small fractional part of the savings

caused by the adoption of their inventions, and is the fruit of honourable enterprise.

I am, Sir, yours, &c.,

CHARLES MAY,

Manager of the Permanent Way Company.

26, Great George-street, Westminster,
Jan. 24, 1855.

[We did not consider that part of "Z's" letter above referred to admitted of the interpretation put upon it by Mr. May—that Mr. Richardson, and consequently Mr. W. B. Adams, as they are joint patentees, made a false declaration—or we certainly should not have given it insertion in our pages. With regard to our own remarks on the Permanent Way Company's circular, it will be observed, that the words Mr. May complains of did not occur in an assertion, but formed part of a sentence put hypothetically.—ED. M. M.]

ON THE INCRUSTATION OF STEAM BOILERS.

To the Editor of the Mechanics' Magazine.

SIR,—Your valuable Journal, so widely circulated among scientific men, appears the only tribunal before which the real and first inventor may claim his rights against second-hand inventors, or authors ignorant of inventions of high merit already existing in practice, of which they claim to have been the first to discover the theories. In your last Number, dated 13th January (No. 1640), I find an extract from the *Journal of Industrial Progress* on the incrustation of steam boilers, reporting, that M. Cousté claims as his own, and as the best means of preventing incrustation, the feeding of the boiler with water heated to a very high degree (318° Fah.) before it is introduced into the boiler. He considers this high degree required for the object, and wants a separate heating apparatus, and, in low pressure engines, a filter to separate the precipitate. In high pressure engines the filter, says M. Cousté, may be dispensed with, as the precipitate in the heater cannot crystallize in the boiler, but will only form a muddy deposit instead of a fixed incrustation. M. Cousté afterwards, by some hypothesis, establishes a formula to prove that the loss of heat by incrustation must amount to 40 or 50 per cent., and therefore that the same per centage of increase in the generation of steam is gained by preventing incrustation by feeding the boiler with hot water. I think, Sir, you will do me the justice to say, that I have a right to claim the priority of this invention, and to correct the theories of M. Cousté by my experience during ten years practice; as you know, that ten years since I obtained a patent under the title "Improvements in high pressure and other steam-boilers, with a new mode or principle of supplying them with water." The invention contained the new mode of feeding the steam boiler with water previously heated and purified. I have already (ten years ago) fitted up such heaters to steam boilers in London, Birmingham, and Leicester, of which I enclose you the certificates, and I can prove by ten years experience, that these steam boilers were fully protected against any fixed incrustation; nothing more than a muddy deposit (and this in a very small quantity) was cleaned out from those steam boilers. I executed, practically, this invention, by fitting three or four cylindrical tubes to the boiler, with an open cylindrical flue inside, surrounded with a ring of water; in these tubes (which I called metallic flues) the water was heated by degrees, only by letting the gaseous products of combustion pass from the flues of the boilers, on their way to the chimney through them; the cold water was supplied to the tube next to the chimney, and passing from one tube to the other fed the boiler with purified boiling water. During ten years constant use, a fixed incrustation was never formed in the steam boiler. These practical results enable me to contradict the necessity of heating the water to a higher degree than the boiling point, to prevent perfectly well any incrustation, and also to show the uselessness of a filter. The sediment in the metallic flues (cylindrical tubes) was from time to time let out by a pipe and cock, and of course all the fuel which M. Cousté wants for a separate heater, is entirely spared by my heating the water with the otherwise lost heat of the flues in their passage to the boiler. My heating to a boiling point and purifying the water, cost, therefore, literally *not a single pound of coals*. And I must also contradict, for I cannot help it, the mathematical formula of M. Cousté's invention, by which he wants to prove the saving in heat equal to about from forty to fifty per cent. My experience is only in low pressure boilers, and there the increase of steam may amount to twenty-five per cent. or to an economy of twenty per cent. in fuel. In high pressure boilers the saving in fuel must, of course, be proportionately greater, considering that the heat from the flues is passing through the metallic flues in a higher degree. These are facts, which can be ascertained at any time, and the question how to constantly prevent the incrustation in boilers, and with so much profit in fuel, in such a simple way (incrustation being often the principal cause of explosion) may be of the highest interest to your readers.

I have, therefore, considered it my duty towards myself and the public, to contradict the theories of M. Cousté, and to establish my right of priority in this invention.

I am, Sir, yours, &c.,

ANTHONY B. VON RATHEN.

4, Crescent-place, New Bridge-street, Blackfriars, Jan. 15, 1855.

PARKER'S PATENT SMOKE-CONSUMING APPARATUS.

To the Editor of the Mechanics' Magazine.

SIR,—At page 61 of your last Number, Mr. Williams, for the second time, enumerates, among other "re-inventions," the smoke-consuming apparatus of Mr. Parker, a description of which appeared at page 445 of your last volume.

In several communications published in your pages, Mr. Williams has admitted the principle of "perforated air distributors" to have originated with Mr. Argand, who applied that principle to the well-known lamp which bears his name.

Mr. Williams claims to have invented and patented a peculiarly-constructed furnace, to which he gave the name of the "Argand furnace," in consequence of its embodying that principle. The mechanical construction and arrangement of the furnace—not the principle of its action—being the invention, and constituting the patent right of Mr. Williams. The perfect efficiency of the principle, as applied in the furnace of Mr. Williams, is indisputable; but it is a fair and legitimate subject for the exercise of inventive thought, whether a more simple, less inconvenient, and cheaper mode of applying the Argand principle to furnaces than that of Mr. Williams might not be devised?

When the application of the principle is embodied in the original construction of the furnace, considerable expense is necessarily incurred; the alteration of old existing furnaces is worse, and all alterations or repairs renders the stoppage of the works inevitable. In order to obviate these inconveniences, Mr. Parker devised the smoke-consuming apparatus before referred to, in which the application of the Argand principle is altogether separate from, and independent of, the original construction of the furnace itself, so that its application in the first instance, and occasional renewals afterward, involves but little expense and no inconvenience; thus affording a ready and convenient remedy for sufferers under the "Smoke-consuming Act."

There is, in this instance, no refined question of chemistry at issue, neither is the claim of Mr. Williams to "the Argand furnace" disputed. There is a question, however, that forces itself upon public attention, and it is a question of considerable importance just now, viz., Is it possible that the simple, inexpensive, and easily applied smoke-consuming apparatus of Mr. Parker is really sufficient for its intended purpose? To this practical question a decidedly practical answer is furnished by the fact, that Mr. Parker's patent apparatus has been for some time past in use at the white lead works of Messrs. Champion at Co., Islington-fields; the chemical works of Messrs. Brandram and Co., Lower-road, Rotherhithe; and the soap manufactory of Messrs. Peyton and Charles, Wapping; as well as at the patentee's works at Deptford, with unvarying success, in each case taking precedence of all other plans in operation in these localities.

If Mr. Williams is acquainted with any similar apparatus as simple, effectual, and economical as that of Mr. Parker in use before the date of that gentleman's patent, then, but not till then, will he be justified in designating Mr. Parker's contrivance "*a re-invention!*"

I am, Sir, yours, &c.,

WM. BADDELEY.

13, Angell-terrace, Islington, Jan. 22, 1855.

THE LUNAR CONTROVERSY.*

To the Editor of the Mechanics' Magazine.

SIR,—I must admit that I rather took it to heart when you decided that the reply, which I had forged out as a thunderbolt to the numerous gentlemen who had taken so much kind trouble to release me from error, was too long for your columns, and that the discussion must of necessity be closed. We were entering on such a warm and lively argument, that I felt much like one of a cheerful Christmas party, when the unlooked-for intrusion of a fireman's hose damps the spirits of the whole circle. However we all must sometimes resign our opinions for the general welfare. I therefore contentedly submit to silence, only assuring my opponents (as you can testify) that I have spared no pains to reciprocate their good offices, and had as great a confidence of converting them as they could have of

* We recently received a long letter from Mr. Mushet, in which he continued the discussion on the Rotation of the Moon by laying down, with great skill, and undiminished confidence, a succession of arguments and illustrations which fully developed his views on that subject. We were compelled, however, for numerous reasons, to abstain from inserting it, and the author has accordingly contented himself with forwarding the above explanatory letter, which we have much pleasure in inserting.

converting me, in which, however, I grieve to say, they have not succeeded, all their efforts having only hardened my unbelief. They are acute champions and I had a real pleasure in contesting with them, and only hope we may meet again, on some other field, to do battle for the truth. Were it not that I have some dread of the solemnities of deliberate authorship, which is a more serious affair than writing a brisk letter on the spur of the moment, to be printed and done with in the same week, I might resolve, *pro bono publico*, to set my light in a candlestick and consign it to the repository of my excellent friend, Mr. Weale, as a sort of rudimentary rudiment of astronomy, though, in fact, it is a question of pure mechanics, comprising nothing astronomical except the name. It would perhaps be only courteous so to do, to give my adversaries the benefit of the thoughts which I am indebted to them for suggesting. "J. C." will then, perhaps, be not so much startled with my views as when their first appearance surprised him, especially as I see, on reperusing his letter, that his illustration was intended to develope the same idea which influences your other correspondents. Duly acknowledging and obliged for all endeavours to enlighten me, I beg to take leave with one remark, which will not, I think, involve any controversy. If any of my friends, in visiting Bath or the "hill abounding Devonshire," should chance to have their locomotion protected by any of the excellent devices lately described in your pages, let them examine the wheel of their carriage, either on a hill or on flat ground, when *sliding* under the pressure of the brake, and when *rolling* free upon its axle. They will then appreciate the difference between us, without any argument. And even should Mr. Cheverton chance to be the voyager, and undertake to bore a hole, by transferring the mere to-and-fro motion of the *sliding wheel*, yet when done, this will hardly accomplish the proof that the *locked rota* is truly rotating. As he entertains the matter on my own ground, that of practical mechanics, this hint will scarcely be thought to re-open the general question.

I am, Sir, yours, &c.,
DAVID MUSHET.

January 22, 1855.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

SIR,—What Mr. Woodcock's ideas may now be, after the explanation given by Mr. Williams and Mr. Mushet concerning the "Cerberus' headed League" I know not; but I think he will not require any further evidence from me. I may, however, state that, so far am I from being in league with Mr. Williams, that I here distinctly wish it to be understood that I am not prepared to coincide with that gentleman in all his views concerning combustion; but I still must say, that he has written the most clear and concise exposition we have upon that subject.

I trust your readers will show a little pity to the gentleman, who has brought his invention before them, as one of the grandest discoveries of modern science, and yet will not allow it to be examined by men who are known to possess a little experience upon this subject as well as himself.

If Mr. Woodcock will take the trouble to refer to my first letter, inserted in your Journal, he will find that the only spirit pervading it, is a desire to prevent your readers supposing the invention to be new in any shape or principle. I had, then, no wish to convince Mr. Woodcock of the error of his theory, for I do not believe, after what he has written, that his conviction would be any gain to the public or a credit to himself. Is it not astonishing that, during all the controversy, he has never brought forth real facts in support of his views, but has always thrown the facts aside by bringing or advancing charges against individuals?

I am, Sir, yours, &c.,
ENGINEER.

Manchester, January 23, 1855.

ORDNANCE AND GUNPOWDER.

To the Editor of the Mechanics' Magazine.

SIR,—I think "Argus," in pointing out the curious illustration of "J. F.," has made an admission as curious and unfortunate as the one pointed out. "Argus" says that the non-explosion of the mixed gases depends, or is universally said to depend, upon the cooling effect of the wire-gauze, and upon that alone.

To me it appears that this is granting all that "J. F" or any one else would demand, since the question is not how does the wire-gauze prevent explosion, but does it prevent it? For aught that "J. F." has said to the contrary, he may subscribe to the universal opinion as stated by "Argus," although I rather think he would not, since he probably knows that cold means the absence of, or a less degree of heat, and not a principle in itself to be imparted by a piece of wire-gauze, which, being simply a good conductor of heat, affords it a rapid transit to the surrounding medium. If the illustration given by "J. F." is not sufficient to show that other conditions are necessary

beside the mere generation of heat, I will add another.

Having drawn the rods of the universal discharger about three quarters of an inch apart, place between them a dram of gunpowder, and discharge an electrical battery of about five or six feet superficial, so that the current shall pass through the powder when the metallic circuit is otherwise closed; the powder will be scattered but not exploded, although an intense white flame has passed through its midst. Every one at all conversant with electrical matters knows this, and the cause of it.

I am, Sir, yours, &c.,

HYDRA.

EXPANDING SELF-CLEANSING SABOT FOR RIFLE-SHOT.

To the Editor of the Mechanics' Magazine.

SIR,—At the present time, when everything connected with the improved efficiency of fire-arms is of public interest, I am sure you will not refuse a place in your impartial Journal to the following statement:—On Saturday last Mr. Warren, who keeps the shooting-gallery in Williamson-square, fired from a rifle of the musket-bore an elongated shot made of brass, having a square shank, half an inch long, projecting from the centre of its base; on this shank the sabot of cork was fixed; the shot, with its attached sabot, was gently rammed home on the charge of powder; the rifle was then fired at a target formed of six planks of deal, at a distance of twenty yards, and the shot struck *point foremost.* This proved that the cork sabot was condensed by the extreme *pressure* of the explosion of the charge so as to fill up the spiral grooves of the rifle, and thus impart the rotatory motion or *spin* round the long axis of the shot. It is better that the rotatory motion should be imparted to the shot by the expanding of the sabot than by the expanding of the shot, as it prevents violent *friction* in passing through the barrel, and tends to *cleanse* it at each discharge. This successful experiment proves that shot similarly affixed to a sabot formed by pressure such as is used in making cups for calenders, and of various material, such as coarse brown paper, can be used from rifle cannon of the largest calibre, and confirms me in the belief that a ten-inch bore rifle gun thus loaded would make a breach through the side of a gun-boat encased in planks of four and a half inch well forged or hammered iron—it will be a very "hard case" if it does not.

I am, Sir, yours, &c.,

J. NORTON.

Owen's Hotel, Jan. 15, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in submarine navigation.* (A communication.) Patent dated July 1, 1854. (No. 1444.)

The inventor describes a steam-vessel constructed for travelling beneath the water, the air in the vessel being purified by the aid of a current of water, or of an alkaline solution composed of water, lime, potash, and oxygen, and the vessel itself being divided into several compartments, &c.

WILDER, JOHN, of the firm of Wilder and Sons, of Reading, Berks, agricultural machinists. *Improvements in agricultural rollers and clod-crushers.* Patent dated July 1, 1854. (No. 1447.)

The improved rollers or clod-crushers are constructed of two or more rollers (three being preferred) set in suitable framework, and moving in adjustable bearings, in order that when used on undulating ground they shall accommodate themselves to it.

MILNE, JOHN KOLBE, of Edinburgh, Midlothian, Scotland, pocket-book maker. *An improved means of holding letters, documents, or other similar articles.* Patent dated July 3, 1854. (No. 1448.)

This invention consists in the application to a board or other suitable back of an elastic band, which is passed through a tube, and confined to the back by its two ends which extend from the ends of the tube.

WALTERS, BENJAMIN, of the firm of Benjamin and Philip Walters, of Wolverhampton, Stafford, lock-manufacturers. *Improvements in spindles for locks and latches, and in the means of adjusting knobs to the same, to suit any thickness of door.* Patent dated July 3, 1854. (No. 1449.)

This invention consists in the employment of a screw collar, which screws on to the angles or edges of the ordinary square spindle.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in stopping bottles, and in drawing off aërated or other liquids contained therein.* (A communication.) Patent dated July 3, 1854. (No. 1450.)

These improvements mainly consist in manufacturing bottles or other vessels for containing gaseous, volatile, or other liquids, with two rims on the neck, at a variable distance apart, and placing between the said rims a metallic ring provided externally with a screw thread or cleats.

GREENSHIELDS, WALTER, of Edinburgh, Midlothian, manager. *Improvements in chenille fabrics.* Patent dated July 3, 1854. (No. 1451.)

The inventor manufactures a fringe by using parti-coloured chenille, either as warp or weft. This fringe, as is usual in this branch of manufacture, is woven in a loom with an amount of warp material sufficient for the production of two selvages at a distance apart equal to the width of two pieces of fringe. The weft when thrown across and woven in with such warp, produces two woven selvages or heads for the two pieces, the fabric being afterwards cut up the centre, and the fringe pieces thus separated.

BALK, WILLIAM, of Ipswich, Suffolk. *An improved friction dynamometer.* Patent dated July 3, 1854. (No. 1452.)

The strap or instrument used for producing the friction in this dynamometer, is connected to the ends of a lever with unequal arms, which causes any shifting of the strap or instrument to increase or decrease its pressure on the friction-wheel, thus adjusting it so as to produce the exact amount of friction necessary to keep the load up. The dynamometer, thus constructed, does not require lubrication.

CHAUVEAU, URBAIN, and CHARLES D'EPINOIS, both of Paris, France, civil engineers. *Improved means or apparatus for preventing collisions on railways.* Patent dated July 3, 1854. (No. 1456.)

By means of small apparatus or machines, placed at convenient distances along the line of railway, so as to strike against a lever, catch, or other contrivance attached either to the engine or the break-carriage of an advancing train, the inventor proposes to bring into action certain levers or mechanical contrivances in connection with the steam ports or valves of the engine, and with the breaks.

SUNTER, JOSEPH, of Derby, engineer. *New or improved drilling-machinery.* Patent dated July 4, 1854. (No. 1457.)

This invention consists in constructing drilling machinery by combining together two or more parallel drills geared together, and actuated by one axis.

TIFFANY, CHRISTOPHER THOMAS, of Leeds, York. *An improvement in the manufacture of brushes used in gig-mills and machinery for brushing piled fabrics.* Patent dated July 4, 1854. (No. 1459.)

This invention consists in the application of the fibres of Brazilian grass in the manufacture of gig-mill and machinery brushes, for brushing piled fabrics.

HAIMES, THOMAS, of Melbourne, near Derby. *Improvements in the manufacture of gloves and mits, by warp machinery.* Patent dated July 4, 1854. (No. 1460.)

This invention consists in causing the thumbs of gloves and mits to be produced simultaneously, with their other portions, by means of machinery patented by the patentee and others, May 10, 1851.

M'GAFFIN, JOHN, of Liverpool, Lancaster, engineer. *Improvements in corrugated cast iron.* Patent dated July 4, 1854. (No. 1461.)

These improvements consist "in forming cast angle iron with corrugations, either on all the parts of the angle iron, or in such manner that some of the parts may be plain and the other parts corrugated; and this applies to T, L, and H cast and angle iron."

DELPECH, JEAN ANDRÉ CÉCILE NESTOR, mechanist, of Castres, in the French Empire. *An improved lift and force-pump, called "Castraise pump."* Patent dated July 4, 1854. (No. 1462.)

This pump consists of an outer casing of cast iron or other suitable material, made in two parts, and separated by a diaphragm or partition. The two parts are bolted together with the diaphragm between them, and to the latter is firmly fixed a thin brass cylinder or barrel, in which the piston moves. We shall probably give an illustrated description of this pump hereafter.

NEWMAN, JAMES, of Birmingham, Warwick, manufacturer. *Improvements in the manufacture of metallic rods, rails, and bars.* Patent dated July 4, 1854. (No. 1463.)

This invention consists in the production of a strong and economical metal rod, rail, or bar, having the appearance of solid metal, but made with "a core or centre of sand, or sandy, earthy, ashy, or other arenaceous material, rendered solid and stony, or vitreous, by ramming or pressure, and the action of the fire during the course of manufacture."

BARDET, JOSEPH MARIE, chemist, and FRANÇOIS COLLETTE, manufacturer, both of Paris, France. *An improvement in the construction of matches.* Patent dated July 4, 1854. (No. 1464.)

Claims.—1. The manufacture of friction matches giving, during the combustion, a flame of sufficient power to resist the action of the wind, and formed by the partial or entire interposition of inflammable phosphorated paste between two light, firm, combustible bodies, the combustibility of which may be enhanced by any suitable preparation; these bodies thus arranged being cut in a convenient form and size to render them fit to be used for friction matches. 2. A mode of moderating and steadying this combustion of the interposed phosphorated paste by thoroughly mixing with the same a small quantity of any suitable finely pulverized, inert, or noncombustible matter. 3. A mode of preventing involuntary combustion by covering the said matches entirely, or partly, with any suitable coating.

GARRETT, RICHARD, and RICHARD GARRETT, junior, of Leiston Works, near Saxmundham, Suffolk, agricultural implement-makers. *Improvements in machinery for drilling seed and manure.* Patent dated July 4, 1854. (No. 1465.)

This invention comprises the application to liquid manure drills of a graduated plate or scale, whereby the attendant is enabled to regulate the discharge of the liquid, so that it shall be delivered on to the land at any given quantity per acre. Also, the application to the fore carriage of drills of a compound lever for facilitating their steerage, and certain means of regulating the delivery.

BISHOPP, GEORGE DANIEL, of Inverness-terrace, Middlesex, civil engineer. *Improvements in the construction and arrangement of engines to be driven by steam, air, gases, or water.* Patent dated July 4, 1854. (No. 1466.)

Claim.—"The arranging and fixing two or more cylinders, of the same or different dimensions, opposite to or near one end of the main shaft of the engine, for the purpose of connecting the pistons or piston rods of such cylinders to levers or arms fixed into or attached to a ball and socket, or universal joint, to which is fixed an arm that takes into the end of a crank on the main shaft, and causes the same to rotate."

ELLIOTT, THOMAS, of Manchester, Lancaster, engineer. *Improvements in safety-valves and apparatus connected therewith, which valves may also be used as steam valves.* Patent dated July 4, 1854. (No. 1467.)

The inventor claims the construction of an annular valve, having one or both of the two faces thereof horizontal or flat, that is, at right angles to the valve spindle; and certain applications of this valve to safety, stop, throttle, and governor valves.

HEYCOCK, HENRY, of Manchester, Lancaster, merchant. *Certain improvements in hydraulic presses, employed for packing or pressing cotton, silk, flax, wool, or other fibrous materials.* Patent dated July 4, 1854. (No. 1468.)

This invention mainly consists in the employment of self-acting apparatus, composed of levers, weights, and valves, for the purpose of throwing in and out of gear, either one or several pumps of hydraulic presses.

BOWLAS, DAVID, of Reddish, Lancaster, manufacturer. *Certain improvements in machinery or apparatus for knitting or manufacturing healds or harness used in looms for weaving.* Patent dated July 4, 1854. (No. 1469.)

This invention consists in the employment of an iron framing composed of two parts, the one forming a frame for the manufacture of the heald, the other being devoted to the working parts of the machinery. The inventor employs for the base of both the top and bottom braid used in the manufacture of weavers' healds or harness, pitched yarn, stretched by weights, to give it a due amount of tension.

CHEVAL, LOUIS JOSEPH, of Raismes, France. *Improvements in beer-engines.* Patent dated July 5, 1854. (No. 1472.)

This invention consists in using the pressure produced by a column of liquid for elevating beer or other liquors from the barrels in the cellar to the tap.

BURCH, JOSEPH, of Crag-hall, near Macclesfield, Chester. *Certain improvements in marine and other steam engines.* Patent dated July 6, 1854. (No. 1473.)

This invention mainly consists in the use of a long cylinder, formed by a combination of several short ones, each having a top and bottom and separate steam ways; and in the use of one piston rod, on which is fixed, at proper distances, a series of pistons, one for each cylinder. The slide valves of the united cylinders are moved simultaneously, and the combined force of all the pistons is transmitted through the one rod. And also in an arrangement of reciprocating frames, to be used instead of the ordinary crank.

RESTELL, THOMAS, of the Strand, Westminster, chronometer-maker. *An apparatus or holder for holding parcels of gloves and other goods and papers.* Patent dated July 5, 1854. (No. 1475.)

This invention consists in connecting two rigid plates or cards, in various ways, by means of elastic threads or braids attached to them.

HARVARD, SAMUEL, of Stoke Holy-cross, Norfolk, and JOSHUA WOMERSLEY, of Stoke Holy-cross, Norfolk. *Heating crushed seed for making cake, for drying seeds, corn, and other grain, and for feeding mill-stones or other grinding apparatus.* Patent dated July 6, 1854. (No. 1479.)

This invention consists in the use "of a cylinder or cylinders heated by steam, hot air, or fire, provided with vanes, fans, blades, or propellers, for propelling the corn, seeds, &c., through the same, and delivering the same as required."

GLASGOW, JOHN, of Manchester, Lancaster, engineer. *Improvements in machinery or apparatus for cutting, compressing, punching, shearing, and shaping metals.* Patent dated July 6, 1854. (No. 1480.)

This invention relates—1. To a machine for cutting and compressing metals into suitable forms for rivets, bolts, and similar articles, the working parts of which are made double for the purpose of multiplying

the amount of work produced by the machine, with the same gearing. The inventor places the fly wheel and gearing of this machine at the top of it so as to keep the gearing out of the way of the workman, thus facilitating his operations and avoiding accidents.—2. To an improved machine for punching, shearing, and cutting metals, such as boiler plates, bar iron, railway tyres, and similar articles. The fly wheel and gearing of this machine is also out of the way of the workman.—3. To an improved machine for cutting and compressing metals into suitable forms for nuts, screw bolts, and similar articles, in which the power of finishing the nuts as well as of cutting them from the bar and punching them is obtained.

Avery, Otis, of Castle-street, London. *Improvements in sewing and stitching machines.* Patent dated July 6, 1854. (No. 1482.)

This invention mainly consists in certain improved forms of needles, by the combined action of two of which and of a single thread, tambour or chain-stitch is formed.

Fontainemoreau, Peter Armand Lecomte de, of South-street, London. *Certain improvements in apparatus for breaking in horses.* (A communication.) Patent dated July 6, 1854. (No. 1483.)

This apparatus is composed of a rod which carries four cross bars, one above the other, each carrying a ring at its extremity. This rod is placed on the centre of the saddle, and stands upwards, being inclined a little forwards. During the breaking in the reins are alternately passed through the rings on either side (beginning with the upper ones) according to the position which the work of the horse requires, and descending so as to shorten the reins as the horse comes in hand.

Lamb, John, of Newcastle-under-Lyne, Stafford, paper manufacturer. *Improvements applicable to machines for cutting paper.* Patent dated July 6, 1854. (No. 1484.)

This invention consists in collecting paper (after it has been cut to the proper size by the ordinary machinery) by self-acting mechanical agents, thereby dispensing with the manual labour required for that purpose.

Nicholson, William Newzam, of Newark, Nottingham, iron founder and agricultural implement manufacturer. *Improvements in hay-making machines, part of which improvements is applicable to carriages generally.* Patent dated July 6, 1854. (No. 1485.)

Claims.—1. Obtaining a backward and forward motion in hay-making machines, by means of inside and outside gearing in one axle-box at each side of the machine. 2. Raising or lowering the working parts from or nearer to the ground, by means of a long arm or lever, cast with or otherwise rigidly attached to the axle-box. 3. Certain means of attaching fork heads to the fork-carrying wheel. 4. The manufacture of shafts from metal tubes joined together and united to an agricultural implement or other wheeled carriage, as described.

M'Connell, James Edward, of Wolverton, Bucks, civil engineer. *Improvements in wheels, axle-boxes, and brakes for railway carriages.* Patent dated July 6, 1854. (No. 1489.)

Claims—1. A mode of forming the body part of railway wheels from a single piece by the aid of pressure and suitably shaped dies and matrices. 2. A mode of constructing brake blocks for railway or other purposes, by inserting two or more blocks of wood into suitably shaped slots formed in a metal shoe or holding frame, the interstices between the protruding portions of such blocks being filled up with lead, wood, or other suitable material. 3. The application of papier maché, or other light material, to the construction of washers or disc-plates for preventing the escape of grease from axle-boxes.

Caralli, Nicholas Michael, of Glasgow, Lanark, merchant. *Improvements in the manufacture or production of ornamental fabrics.* Patent dated July 6, 1854. (No. 1490.)

The zebra goods produced according to this invention present a different and distinct printed pattern on each side. According to one modification of the system of manufacture a plain twilled or other fabric, having no flushing or back lashing on either of its surfaces, is used as the groundwork for the production of this duplex pattern.

Pole, William, of Storey's-gate, Westminster, civil engineer. *Certain improvements in the construction of railways.* Patent dated July 6, 1854. (No. 1491.)

The inventor forms the "point," or angular piece of the crossing, by combining two converging rails together, so that they shall mutually assist each other in sustaining the weight of the train passing over either of the lines of rail with which the point is connected; and he proposes tapping the fish-plate fastenings, &c.

Lacey, William, of Lozell's-lane, Aston-juxta-Birmingham, Warwick, agent. *A new or improved method of making copper rollers, cylinders, and tubes.* Patent dated July 7, 1854. (No. 1493.)

This invention consists in casting hollow cylinders in cast-iron moulds, so constructed that the liquid metal shall enter at the bottom of the moulds, so that the metal in

them shall be undisturbed by air bubbles carried down by the stream of metal, and the casting consequently sound; and also in a method of shrinking an old roller upon another, &c.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in stoppers for bottles and other vessels, and in apparatus connected therewith.* (A communication.) Application dated July 1, 1854. (No. 1445.)

This invention relates to the employment of gutta percha and caoutchouc, either vulcanized or not, in the manufacture of stoppers or covers for bottles and other vessels; also to certain improvements in the shape of the stoppers, and to a peculiar form of instrument for drawing them.

HUTCHISON, GEORGE, of Glasgow, Lanark, merchant. *An improvement or improvements in the manufacture of soap.* Application dated July 1, 1854. (No. 1446.)

This invention "consists in washing and cleansing from the foreign matters or impurities the nigre of one pan with the spent salt ley of a succeeding and adjacent pan, and when this last has been completely made, and is ready for what is technically called "the finish," the nigre of the former pan, which has been washed as before stated, is transferred to this second pan, and finished along with it."

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improvement in the construction and arrangement of marine steam engines.* (A communication.) Application dated July 3, 1854. (No. 1453.)

This invention consists in employing two steam cylinders placed transversely and very near the vessels' bottom, the piston-rods of which pass through them in opposite directions, and impart, by means of coupling links and levers, "a reciprocating motion to rock shafts, which transmit motion to the crank on the propeller-shaft, by levers and connecting-rods acting nearly at right angles to each other."

HOPKINSON, JOSEPH, the younger, of Huddersfield, York, engineer. *Improvements in steam boilers and furnaces, and in apparatus connected therewith.* Application dated July 3, 1854. (No. 1454.)

This invention consists mainly in arranging a number of boilers side by side, and adapting furnaces in such manner that the products of combustion are caused to pass over their surfaces in a transverse direction, instead of in the direction of their length. The series of boilers are connected together by means of pipes, so as to constitute one steam generator.

GUICHARD, EDOUARD AUGUSTE DESIRÉ, of Paris, France, designer. *Improvements in ornamenting the surfaces of various articles and fabrics.* Application dated July 3, 1854. (No. 1455.)

This invention consists in the application to oil-cloth of certain substances to form a flock surface, either on the underside, as a substitute for the woollen surface ordinarily produced, or for the production of ornamental designs on the upper side, and in the application of the improved flock to the manufacture of toys, &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in obtaining motive power.* (A communication.) Application dated July 4, 1854. (No. 1470.)

This invention consists in employing "a long cylinder fitted with a piston which is acted upon on one side by any elastic force, such as steam, compressed air, or any expansive gas, the other side of the piston being acted against by a column of fluid, which fluid is also acted upon by compressed air or other elastic power contained in a vessel in connection with the other end of the cylinder."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *An improved system or mode of coating iron with copper.* (A communication.) Application dated July 4, 1854. (No. 1471.)

This invention consists—1. In the application of the sulphate of copper for the galvanic coating of iron which has been previously covered by a thin preservative coating, for the purpose of preventing the sulphuric acid of the sulphate from acting upon the iron. 2. In the application of a thin preservative coating on the iron which is to be coated with copper, by the aid of the sulphate of copper. 3. In the application of lead as a preservative coating, as a substitute for copper. 4. In the application to this operation of baths of copper and lead. 5. Of a process for cleaning the metal surfaces.

SYMES, WILLIAM, of Pimlico, Middlesex, gentleman. *Improvements in tills.* Application dated July 5, 1854. (No. 1476.)

These improved tills are divided into three compartments, each of which has a hinged top, and over the two compartments intended for the reception of gold and silver is placed a piece of glass or wire work, and connected to the underside of each top is a box into which the coins fall, and remain visible until passed into the lower part of the till, by the withdrawal of a slide and rod.

GRUBB, THOMAS, of Dublin, civil en-

gineer. *Improvements in microscopes.* Application dated July 5, 1854. (No. 1477.)

These improvements consist—1. In arranging a "stage," or object holder, capable of movement through an entire revolution, the usual slow motions in opposite directions being obtained by cam rings. 2. In employing a new form of prism which, when suitably mounted, effects every kind of illumination required both for translucent and opaque objects, by its own revolution and without changing the position either of the microscope or of the source of light. 3. In the addition of a graduated sectoral arc to microscopes concentric to the planes of the object *in situ*, on which either the aforesaid prism or other suitable illuminator is made to slide, thereby producing every kind of illumination required for microscopic examination, and also the means of registering or applying any definite angle of illumination at pleasure.

VENABLES, JOHN, and ARTHUR MANN, both of Burslem, Stafford, earthenware-manufacturers. *Printing self and other colours in bas-relief or raised work on china, earthenware, glass, parian, stoneware, bricks, blocks, tiles, quarries, hardware, japan, and papier-maché ware.* Application dated July 5, 1854. (No. 1478.)

The inventors propose, by means of deeply cut engravings or matrices, to receive the coloured matter, and to deposit it upon the articles mentioned in the title.

ARROWSMITH, JOHN, of Bilston, Stafford, engineer. *A new or improved method of consuming or suppressing smoke and obtaining motive power therefrom.* Application dated July 6, 1854. (No. 1481.)

The inventor causes heated air and smoke to pass through and over one or more coke fires, "whereby the said smoke becomes so heated that it combines with the oxygen of the air with which it is mixed, and the heat thus obtained may be used to heat a steam boiler or for other purposes."

RADCLIFFE, JOHN, of Stockport, Chester, machinist. *Certain improvements in power-looms for weaving.* Application dated July 6, 1854. (No. 1486.)

This invention consists in the use of elastic surfaces in certain parts of power-looms, for the purpose of adjusting, regulating, and softening the impulsive action of the "picker" in lieu of the "check-strap," or other contrivance hitherto employed.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery or apparatus for effecting agricultural operations, parts of the said improvements being applicable for the obtainment of motive power for general purposes.* (A communication.) Application dated July 6, 1854. (No. 1487.)

This invention consists of modifications of the agricultural apparatus patented by the patentee, May 10, 1853.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in electro-magnetic engines.* (A communication.) Application dated July 6, 1854. (No. 1488.)

This invention consists in "the arrangement and combination of the helices and poles of the electro-magnets in combination with revolving bars, the helices being upon the bends of the magnets from which the poles of the magnets extend, towards the centre of motion; and the revolving bars or armatures extend outwards from the centre of motion, and embrace the poles of the magnets successively as the revolution goes on."

PETRIE, JOHN, jun., of Rochdale, Lancaster, ironmonger. *Improvements in machinery or apparatus for washing or scouring wool.* Application dated July 6, 1854. (No. 1492.)

This invention consists in the adaptation to a wool-washing or scouring machine of apparatus which acts upon the principle of combing or opening out the fibres by a series of teeth or prongs.

*** The documents of No. 1474 are with the Law Officers under objection.

PROVISIONAL PROTECTIONS.

Dated December 1, 1854.

2525. Joseph Whitworth, of Manchester, Lancaster, engineer. Improvements in cannons, guns, and fire-arms.

Dated December 28, 1854.

2735. Margaret Williams, of Chelsea, Middlesex. Improvements in suspending swing looking or dressing-glasses.

2737. Peter Haworth, of Manchester, Lancaster, currier and leather dealer. An improved belt, band, or strap-fastener.

2738. Richard Threlfall, of Bolton-le-Moors, Lancaster, machine maker, and Robert Walker Pitfield, of the same place, mechanic. Improvements in machinery or apparatus for spinning cotton, wool, or other fibrous materials.

2739. James Murdoch, of Staple-inn, Middlesex. Improvements in waterproofing woven fabrics. A communication.

2741. John Gray, of Strand-street, Liverpool. Improvements in adjusting compasses on board ships or vessels.

2742. Gerd Jacob Bensen, of Christian-street, St. George's-in-the-East. An improvement in refining sugar.

2743. Henry Charles Hill, of Parker-street, Kingsland, London. Improvements in portable dwellings, barracks, and similar dwellings, part of which invention consists in rendering such buildings, and also ships, proof against shot or bombs.

Dated December 29, 1854.

2744. James Nasmyth, of Barton-upon-Irwell, Lancaster, engineer. Certain improved machinery

or apparatus for facilitating the forging of masses of iron.

2745. Frederick Thompson and William Wagstaff, of Pall Mall East. Improvements in photography.

2746. Andrew Dietz and John G. Dunham, of Raritan, New Jersey, United States of America. Improvements in mowing and reaping machines, by which the sickle cutting the grain is moved or worked directly by the driving wheel or its equivalent, without the necessity of cogwheels, cranks, &c.

2747. Ashton Stansfield, of Todmorden, Lancaster, cotton spinner and manufacturer, and Josiah Greenwood, of the same place, manager. Certain improvements in power looms for weaving.

2748. John Zephaniah Bell, of Sandfield-place, Lewisham-road, Kent, gentleman. Improvements in the manufacture of boots and shoes.

2749. Henry Widnell, of Lasswade, Midlothian, North Britain, carpet manufacturer. Improvements in the manufacture of carpets and other textile fabrics.

2750. Edward Loysel, of Rue de Grétry, Paris, France, civil engineer. An improved lavement or injecting machine.

2751. Thomas Thorneycroft, of Wolverhampton. Improvements in ship-building.

2752. James Pillans, of Brompton-crescent, Middlesex. Improvements in the preparation of hematosin and fibrinous and serous matters.

2753. Henry Richardson Fanshawe and John Americus Fanshawe, of North Woolwich, Essex, manufacturing agents. Certain improvements in the manufacture of various kinds of waterproof garments.

Dated December 30, 1854.

2755. Robert Chapman, of Manchester, Lancaster, and John Miller, of Stalybridge, in the said county. Improvements in machinery or apparatus for spinning and doubling cotton and other fibrous materials.

2757. George Mallinson, of Manchester, weaver, and Horatio Ridings, of Newton-heath, near Manchester, card-cutter. An improved manufacture of woven fabric.

2759. George Edward Dering, of Lockleys, Herts. Improvements in obtaining motive power when using electric currents.

2761. Thomas Slater, of Somers-place West, St. Pancras, Middlesex, optician, and Joseph Tall, of Crawford-street, Marylebone, tool-maker. Improvements in the construction of planes and in cutting apparatus, and in the machinery or apparatus employed therein.

2763. Bernard Hughes, of Donegal-place, Belfast, Ireland. The better and more effectual heating of bakers' ovens.

Dated January 3, 1855.

12. John Keir Harvey and Daniel Pearce, of London, Middlesex. A calendar inkstand.

14. Hippolyte Fontaine, engineer, of Marseilles, France. Improvements in engravers' presses.

16. William Kendall and George Gent, of Salford, near Manchester, Lancaster, machinists. Improvements in machinery or apparatus for cutting metals either solid or tubular.

18. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. An improved system or mode of coating iron with copper. A communication.

20. Charles Hustwick and William Bean, of Kingston-upon-Hull, carriage and harness manufacturers. Improvements in buffers and springs for railway carriages and other purposes.

22. John Venables and Arthur Mann, of Burslem, Stafford, earthenware manufacturers. Improvements in producing raised figures or ornaments upon the surfaces of articles made of metal, pottery, and earthenware, glass, papier maché, and other materials.

24. Thomas Webster Rammell, of Trafalgar-square, Middlesex. Improvements in boiler and other furnaces.

Dated January 4, 1855.

26. Charles Watt, of Victoria-wharf, Regent's-park Basin, chemist. An improvement in preparing coffee.

Dated January 5, 1855.

28. George Bowden, bookbinder, of Little Queen-street, High Holborn, Middlesex. Improvements in the manufacture of united adhesive book head-band and register ribbons.

30. Louis Dominique Girard, civil engineer, of Paris, French empire. Certain improvements in applying steam, fluids, and gases, for the purpose of obtaining motive power, parts of which are applicable for compressing and rarefying air and gases, and for raising liquids.

32. John Livesey, of Kensington Gore, Middlesex, gentleman. Improvements in printing, and in the materials and apparatus connected therewith. A communication.

Dated January 6, 1855.

34. Benjamin Cook, of Green-street, Birmingham, Warwick, metallic bedstead and tube manufacturer. Certain improved apparatus for separating filings of iron or steel from other metallic filings.

36. Toussaint Delabarre and Angéline Bonnet, of Paris, France. Improvements in the preservation of substances for food.

38. David Joy, of Worcester, engineer. An improvement in pistons.

40. George Hallen Cottam and Henry Richard Cottam, of St. Pancras Iron Works, Old St. Pancras-road. An improvement in the manufacture of iron bedsteads.

Dated January 8, 1855.

42. William Grindley Craig, of Gorton, near Manchester, Lancaster, engineer. Improvements in railway buffer-cases and rams.

44. Joseph Player, of Winchester buildings, London, civil engineer. Improvements in the construction of furnaces for the prevention of smoke.

46. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved mode of obtaining alcohol. A communication.

48. Albert Nagles, of Ghent, Belgium, chemist. Improvements in machinery or apparatus for cleaning the surfaces of woven fabrics, and also for distending or spreading the same either before or after, or during the processes of bleaching, printing, or other similar operations.

Dated January 9, 1855.

50. Samuel Smith Shipley, of Stoke Newington, Middlesex. Improvements in machinery and apparatus for washing or cleansing.

52. Thomas Hodgson, of Morley's Hotel, Westminster, architectural modeller. An improved construction of paddle-box life boat.

54. André Gaspard Guesdron, of Paris, France. A furniture table which may be used for different purposes.

56. Nathaniel Jones Amies, of Manchester, Lancaster, small ware manufacturer. Certain improvements in winding or balling thread or yarn, and in the machinery or apparatus connected therewith.

58. Ebenezer Bow, of Glasgow, Lanark, North Britain, coal merchant. Improvements in the manufacture or production of "blackening," for foundry purposes.

60. John Lamb, machinist, and Francis Best Fawcett, carpet manufacturer, of Kidderminster, Worcester. Improvements in certain parts of the

machinery employed in the production of various fabrics in which bobbins are used.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

79. Auguste Edouard Loradoux Bellford, of Essex street, London. Improvements in tanning. A communication from Messrs. Rene de Kercado Molac and Jean Daniel Friedel, of Strasbourg, France. January 12, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 23rd, 1855.*)

1983. Edward Gillman. Obtaining filaments from certain vegetable substances, and applying the same to various manufacturing purposes.

1988. William Nash and John Jewell. Improvements in window-sashes and frames.

2006. Andrew Barclay. Improvements in refracting and reflecting telescopes.

2026. Martin Billing and Walter George Whitehead. A new or improved waterproof paper.

2033. Auguste Edouard Loradoux Bellford. Certain improvements in machinery for washing paper stock. A communication.

2036. Auguste Edouard Loradoux Bellford. A new mathematical instrument to be termed the "horometer," for the purpose of solving problems in plane and spherical trigonometry, one feature of which invention is or may be applicable in the construction of other mathematical instruments. A communication.

2037. Henry Hudson. Improvements in the manufacture of vessels for measuring fluids.

2038. William Prior Sharp and William Weild. Improvements in machinery for winding, cleaning, doubling, spinning, and throwing of silk.

2052. Thomas Banks and Henry Banks. Improvements in apparatus for retarding and stopping railway trains.

2063. Henri Catherine Camille de Ruolz and Anselme Louis Marie de Fontenay. Improvements in the treatment of certain metals for producing an improved metallic alloy.

2076. Jonathan Edge. Improvements in pistons.

2082. John Rogerson and James Brimelow. Improvements in certain parts of steam engines.

2093. Thomas Mohan. An improved churn.

2133. Aimé Antoine Joseph Legentil. Certain improvements in pumps or machinery for raising and forcing water and other fluids.

2226. Auguste Edouard Loradoux Bellford. Certain improvements in breech-loading fire-arms. A communication.

2525. Joseph Whitworth. Improvements in cannons, guns, and fire-arms.

2621. John Louis Jullion. Separating certain vegetable fibres from mixed fabrics for various useful purposes.

2647. Daniel Chandler Hewitt. Improvements in the construction of pianofortes.

2687. George Tomlinson Bousfield. Improvements in machinery for splitting leather. A communication.

2702. John Hunt. An improvement or improvements in illumination.

2727. George Carter and Henry Cyrus Symons. Improvements in boilers and furnaces, and in the apparatus for supplying and regulating the fuel, air, water, and steam.

2736. John Cockcroft. Improvements in machinery or apparatus for printing woven or textile fabrics and yarns.

2737. Peter Haworth. An improved belt, band or strap-fastener.

2739. James Murdoch. Improvements in waterproofing woven fabrics. A communication.

2744. James Nasmyth. Certain improved machinery or apparatus for facilitating the forging of masses of iron.

2745. Frederick Thompson and William Wagstaff. Improvements in photography.

2749. Henry Widnell. Improvements in the manufacture of carpets and other textile fabrics.

2752. James Pillans. Improvements in the preparation of hematosin and fibrinous and serous matters.

2761. Thomas Slater and Joseph Tall. Improvements in the construction of planes and in cutting apparatus, and in the machinery or apparatus employed therein.

30. Louis Dominique Girard. Certain improvements in applying steam, fluids, and gases, for the purpose of obtaining motive power, parts of which are applicable for compressing and rarefying air and gases, and for raising liquids.

36. Toussaint Delabarre and Angéline Bonnet. Improvements in the preservation of substances for food.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners' office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed January 19, 1855.

1599. Sir John Scott Lillie.
1621. Richard Roberts.
1623. Auguste Castets.
1629. William Grundy.
1647. William Littell Tizard.
1695. Richard Archibald Brooman.
1697. John Simon Holland.
1755. Peniston Grosvenor Greville.
1849. William Shepherd Smith.
1975. Peter Rothwell Jackson.
2051. Pietro Feloj.
2465. John Henry Johnson.
2475. George Collier.

Sealed January 23, 1855.

1630. Ephraim Hallum.
1641. John Chilcott Purnelle
1643. Louis Christian Koeffler.
1664. Robert Henry Thompson.
1676. John Yuil Borland.
1684. Henry Adams.
1696. Thomas Edward Merritt.
1714. Charles Weightman Harrison.
1715. Auguste Boissonneau.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

Watt.—We have not the work you refer to at hand, and cannot therefore reply to your inquiry.

J. A. R.—We have no hesitation in saying that, in the case you mention, our abstract was sufficiently comprehensive to give you the entire substance of the invention.

Z. Z. and Romanus.—Your remarks respecting the *comparative* merits of Russian and English weapons of war, only state what thousands of our countrymen are at this moment deploring.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co., Dublin; W. C. Campbell and Co., Hamburg.

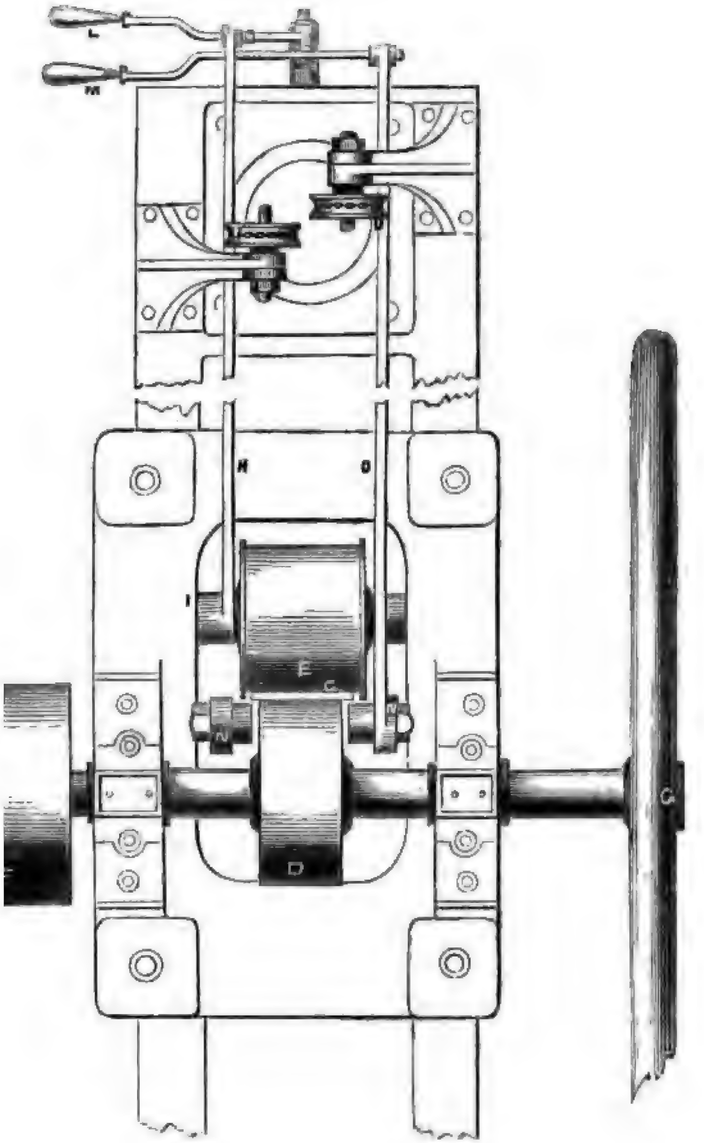
Mechanics' Magazine.

643.] SATURDAY, FEBRUARY 3, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

KITSON'S IMPROVED FRICTION HAMMER.

Fig. 2.



KITSON'S IMPROVED FRICTION HAMMER.

(The following paper was recently read at the Institution of Mechanical Engineers, Birmingham.)

THE hammer described in the present paper has been in use for some time at the author's works, in Leeds, where it was originally constructed as a simple and inexpensive hammer, for the heavier smiths' work; and the present description has been prepared only in compliance with a request to communicate to the Institution the particulars of this hammer, as possessing some practical advantages of efficiency and simplicity.

An elevation of the hammer is shown in fig. 1, and a plan in fig. 2. The hammer block, A, weighing 5 cwt., is guided by grooves in the same, B B, and is lifted by the flat wrought-iron friction bar, C C, 5½ inches wide, and ⅝ inch thick, fixed into it by a T head, with two cotters, S S. The friction bar, C, is raised by two rollers, D and E, carried on the cross frame at top, one of which, D, runs loose on its axle, and the other, E, is fixed on a shaft which is driven continuously by the pulley, F, and carries a fly-wheel, G G, at each end, to give momentum for lifting the hammer. The axle of the roller, D, is carried by a bent lever, H, which works on a fixed centre, I, below the roller, and has a chain connected to the outer end, passing over a pulley, T, and attached to the weight, K. This weight presses the tightening roller, D, towards the driving-roller, E, and grips the friction bar, C, between them, causing the hammer to be drawn up rapidly; the hammer being prevented from being lifted too high by a timber stop at the top of the frame. A handle, L, is connected by a rod to the extreme end of the lever, H, and by pressing down this handle, the tightening roller, D, is drawn back slightly, releasing the friction-bar, C, and allowing the hammer to fall. On releasing the handle, L, from the pressure, the hammer is again lifted by the bar being gripped between the rollers, and it is again let fall from any height desired by pressing down the handle. The man holding the handle has thus complete control over the hammer, by simply pressing down the handle, or letting it rise again; and he can readily regulate the rapidity, or length of the stroke, as required. The present hammer makes from 25 to 30 strokes per minute, when lifted to the full height, 5 feet; about 40 per minute with a stroke of 2 feet, and 84 per minute with 14 inches length of stroke. The driving pulley makes 132 revolutions per minute, whem the hammer is at work.

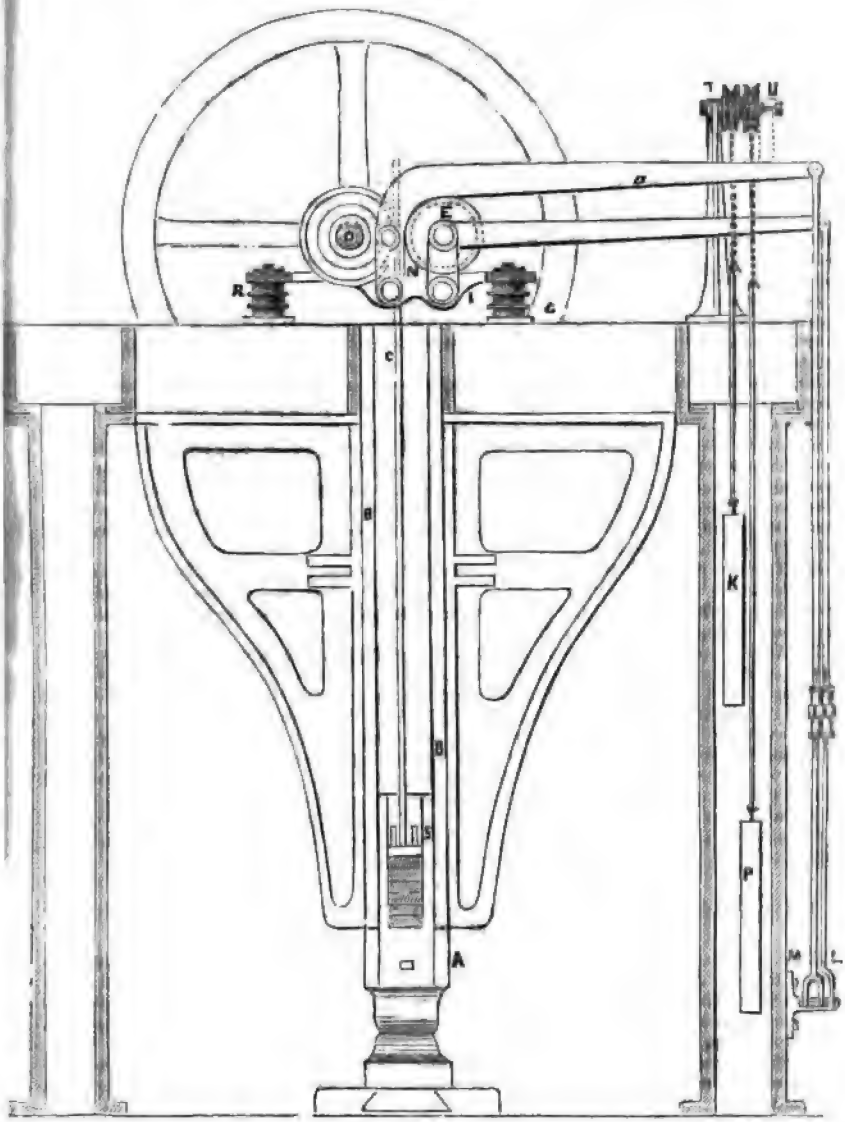
The second handle, M, works a friction clip or break, N, serving to check the hammer, and hold it fast in any position. This break, N, is fixed at the end of a second bent lever, O, working on a centre below, and lifted up by a chain, U, and a second weight, P, working by the side of the other weight, inside one of the hollow columns of the framing. This weight presses the break towards the tightening-roller, D, the lifting bar being gripped between them by the opposing pressure of the two weights, holding up the hammer in any position that it may be in. The break handle, M, is held down continuously whilst the hammer is working, the man holding this in one hand, and the lifting handle, L, in the other hand; by means of which the working of the hammer is managed with great expedition and accuracy, and it can be instantly stopped and held fast whenever required, by merely letting go the break-handle. The grip of the lifting rollers, and of the break, is always the same, being produced by the pressure of the two weights, and consequently always properly adjusted, not being dependent on the pressure of the man's hand, which is only employed to release the pressure of the weights. The frame that carries the bearings of the lifting rollers and break, is mounted upon four India-rubber springs, R R, fixed upon the main cross frame, for the purpose of relieving the friction-bar from the shock of suddenly putting the hammer into full motion, when the lifting rollers lay hold of the bar; the India-rubber springs are compressed at the first moment, allowing the lifting rollers to drop a little, whilst the hammer is getting into motion. The bottom T end of the friction-bar is bedded upon several thicknesses of wood, 12 inches thick in all, fixed in the hammer-block, the elasticity of which relieves the lifting-bar from the end concussions, when each blow of the hammer is struck.

When this hammer was first constructed, the friction-bar, which was rather smaller (4 inches by ⅝ths inch), was fixed in the hammer with a single 4-inch piece of wood below it, and the India-rubber springs were not adopted; and it was found that the cotters, S S, broke very frequently, about twice a week. India-rubber, ⅝ths inch thick, was then put in between the cotters and T head of the bar, with a better result; and the India-rubber springs were afterwards introduced, with the wood packing below the T head of the bar. This arrangement has been found to work very successfully, and it has been in regular work for the last nine months, without accident or repair.

The only wear that is found to take place in the machine is in the friction-bar, near where it is first caught by the lifting-rollers, for a length of about 14 inches; the wear being

at the rate of nearly ⅛th inch thickness per week, when in constant work. This repair costs very little time and expense, requiring only smiths' work; but in the case of making another similar hammer, it would be preferred to make the bar 7 inches wide instead of 5½ inches, to diminish the wear.

Fig. 1.



The Chairman (Mr. W. Fairbairn) said, he regretted that Mr. Kitson had been unexpectedly prevented from being present at the meeting. He thought the hammer that had been described was an ingenious and efficient arrangement, and would prove useful and econo-

mical in many smiths' shops. The same principle might probably be advantageously applied to many of the stamping processes, in brass and iron manufactures, such as those of the Birmingham district, in place of the slower and more expensive processes of hand labour, at present in use.

Mr. McConnell remarked, that he had seen the hammer at work, in Mr. Kitson's works, and was much pleased with its action. It was a very efficient machine, well arranged for the purpose, giving a very complete command over the action of the hammer, with a simple and inexpensive construction. He thought that kind of hammer was very applicable, where a steam hammer would be too expensive; and he was strongly of opinion, that power hammers would soon become much more generally used, in all works, in place of hand labour, as a great part of the ordinary smiths' hammer-work might be done more efficiently and economically by power.

Mr. Sampson Lloyd said, he had had a friction hammer on a similar principle in use for some years, in his works at Wednesbury; it worked well, and was found a useful tool; they had not found any great wear of the friction-bar take place, and the same bar has been working for a year, he believed, without requiring repair.

The Chairman remarked, that the hammer described in this paper seemed to have a defect in the rapid wear that took place in the lifting-bar, and he thought this might be avoided by adopting some different material: he inquired what was the difference in the construction of Mr. Lloyd's hammer?

Mr. Sampson Lloyd replied, that the lifting-rollers were faced with wood, which prevented the wear of the friction-bar; the rollers were worn away instead of the bar, but the wear of the rollers was not important; the wood lasted for nearly a year, he believed, without renewal.

Mr. Fernie said he had seen a similar hammer in use some ten years since at Messrs. Forrester's works in Liverpool, which worked very well. With the exception of the India-rubber springs, the machines were nearly the same.

Mr. McConnell remarked, that the advantage of applying power, in place of hand labour, was being experienced more and more in all manufactories, and the application was extending more rapidly than it had done, as more effective and expeditious, as well as more economical. At the Wolverton works they had greatly increased the number of power hammers, as well as other machines, with a marked advantage in economy, and facility for executing the work.

Mr. Johnson observed, that another instance of the same principle was Ryder's forging-machine, which was found very convenient and advantageous, and was now used to a large extent in Manchester and other places, taking the place of hand work, and making an important saving in expense and time.

The Chairman said he had lately seen a number of those machines in the Government factory at Woolwich, where it was intended to have all the hand labour of forging done by machinery, and a long range of these machines were being erected down one side of a shop, with the fires adjoining, and merely requiring to be attended by one man each. In those machines the motion was given by an eccentric, and the strokes were very rapid, being suitable for the smaller hand-forging; the friction hammer that had been described in the paper read, was adapted for the heavier hand-work, for which it appeared well suited, and also probably applicable with advantage to other manufacturing processes.

He considered it was an important advantage that the Institution afforded the opportunity of bringing forward such practical subjects, and eliciting valuable information in their discussion from the experience of the members.

ON THE PROPULSION OF SHIPS BY THE REACTION OF JETS OF WATER.

This important question has been brought before the Institution of Civil Engineers several times of late. On the last occasion, in April last, Mr. Gravatt complained of the manner in which it was received, and has endeavoured to remedy the injustice, which he believes was then committed, by printing and circulating a "Letter on Steam Gun-boats, of shallow draught and high speed."

The theory contained in this letter we now propose to examine, as, whether we agree with Mr. Gravatt or not, we are sure that we are forwarding his wishes by publicly canvassing this matter.

His proposal consists in this—to make an aperture in the bows of the vessel, through which water will flow while the vessel is in motion, and will rise to a certain level, where he places a tank, called the lower tank; this height of course will depend on the velocity with which the ship or boat is moving. The water is pumped from this tank to a tank on a

higher level, called the upper tank, whence it is permitted to fall freely to the original level of the first made orifice, and is allowed to issue through another orifice, whose section is made of such a size that the quantity of water which issues in a given time, shall be equal to that which is admitted. The reaction of the issuing jet, or tail water, will, he supposes, be sufficient to keep the vessel moving at a high velocity with little loss of power.

According to this theory, putting

a_1 = area in square feet of section of the head water.

a_2 = " " tail water.

v_1 = velocity of vessel.

v_2 = velocity due to the height through which the tail water falls from the upper tank.

P = horse power of engine, used for pumping, divided by 60 to reduce the time to seconds.

E = effective horse power, for propulsion of vessel, divided by 60.

He obtains

$$\begin{aligned} E &= 2a_1v_1^2(v_2-v_1) \\ P &= a_1v_1(v_2^2-v_1^2) \end{aligned}$$

$$\text{and } \frac{E}{P}=\frac{2v_1}{v_2+v_1}$$

With his conclusion, so far, we do not quarrel, although we have somewhat to say regarding his mode of obtaining it.

He *assumes* (for, notwithstanding his supposed proof, it is really an assumption) that the counter-pressure of an effluent jet is double of the pressure of the column of fluid due to the velocity. Thus $a_1\,v_1$ being the volume of water admitted in 1″ moving with the velocity v_1 he assumes the constant pressure which it produces to retard the vessel to be $2a_1v_1^2$, and therefore the work done to reduce it to rest, to be $2a_1v_1^2$. Now one half of the *vis viva* of this mass of water is

$$=\tfrac{1}{2}\frac{wa_1v_1}{g}\times v_1^2=a_1v_1^3$$

since w (weight of cubic foot of water)$=2g$ very nearly.

It is a mechanical principle that the work which must be expended to reduce a moving mass to rest, is one half the *vis viva*. The work, therefore, so expended in the case before us, is equal to $a_1v_1^3$, instead of $2a_1v_1^3$. The same error he repeats with regard to the tail water. The true investigation is as under.

Work expended in reducing head water to rest and raising it to the level of the lower tank$=a_1v_1^3$.

The tail water issues from the boat with the relative velocity v_2-v_1, hence the issuing stream is capable of performing an amount of work$=a_2v_2(v_2-v_1)^2$, which is uselessly expended. The whole amount of work it could perform being that due to the mass section a_2 with velocity $v_2=a_2v_2^3$ as before.

The work actually performed is, therefore,

$$\begin{aligned} &=a_2v_2^3-a_2v_2(v_2-v_1)^2 \\ &=a_2v_2\{v_2^2-(v_2-v_1)^2\}=a_2v_2v_1(2v_2-v_1) \\ &=a_1v_1^2(2\,v_2-v_1),\text{ since } a_2v_2=a_1v_1. \end{aligned}$$

Hence the effective useful work

=Work done by tail-water—Work done in reducing head-water to rest.

That is, $E=a_1v_1^2(2\,v_2-v_1)-a_1v_1^3=2\,a_1v_1^2(v_2-v_1)\ldots.(\text{I.})$

Also P=Work done by pumps in raising the water from the lower to the higher level.

$$=a_1v_1(v_2^2-v_1^2)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(\text{II.})$$

$$\therefore\frac{E}{P}=\frac{2\,a_1v_1^2(v_2-v_1)}{a_1v_1(v_2^2-v_1^2)}=\frac{2v_1}{v_2+v_1}\ldots\ldots\ldots\ldots.(\text{III.})$$

Now, with this result Mr. Gravatt is satisfied; there is, however, an important part of the question which he entirely overlooks.

He assumes the relation of v_2 to v_1 to be perfectly arbitrary; it is, however, nothing of the kind.

Let A be the effective midship section of the ship or boat, by which we mean that *plane*,

which moving directly through the fluid, experiences the same resistance as the vessel, and which will in all ships bear a certain ratio to the actual midship section depending on the form of the vessel's bows.

Then Av_1^3 is the work expended by the resistance to the vessel's motion, and this must be equal to the effective work expended on the propulsion:

$$\text{or} \quad 2a_1v_1^2(v_2-v_1)=Av_1^3 \ldots\ldots\ldots\ldots\ldots (\text{IV.})$$

$$\text{whence,} \quad \frac{v_2-v_1}{v_1}=\frac{A}{2a_1};$$

$$\text{or} \quad \frac{v_2}{v_1}=\frac{A+2a_1}{2a_1} \ldots\ldots\ldots\ldots (\text{V.})$$

Hence the ratio of v_2 to v_1 is not arbitrary, but depends on the ratio of the effective midship section to the section of the head-water. We believe that we are quite within the mark in assuming that the former cannot, without great inconvenience, be less than six times the latter. Putting therefore $A=6a$, we have

$$\frac{v_2}{v_1}=4.$$

And since the heights of the upper and lower tanks are as the square of these velocities, putting h_1 and h_2 for these heights respectively,

$$h_2=16h_1;$$

and since high speed is the great desideratum, if $v_1=25$, which corresponds to a velocity of 15 knots an hour, $v_2=100$, and $h_2=156\frac{1}{4}$ feet. And the ratio

$$\frac{E}{P}=\frac{2v_1}{v_2+v_1}=\frac{2v_1}{5v_1}=\frac{2}{5};$$

or the *theoretic* loss of power is three-fifths.

Taking the lower ratio

$$\frac{A}{a_1}=4 \quad \frac{v_2}{v_1}=3.$$

And for a velocity of 15 knots an hour, the upper tank must be at a height of 88 feet nearly, and the loss of power is one half.

Even assuming $A=2a_1$ only

$$v_2=2v_1,$$

the height of upper level is 39 feet, and the loss of power is one-third.

By what arrangement a tank can be placed in a gun-boat of shallow draught at a height of 39 feet above the water-line, or anything equivalent to this, without great sacrifice of space, it is impossible to imagine.

It is therefore evident, if our theory be correct, and we fearlessly challenge inquiry into it, this mode of propelling vessels is in all cases very clumsy, entailing great loss of power and most inconvenient arrangements; but is most especially unsuited to gun-boats of shallow draught and high velocity. Besides these objections, which we think fatal, there is also to be considered the difficulty of obtaining a back-turn in such a mode of propulsion without great sacrifice of room and power; and further still, from the fact that the apertures are placed below the water-line, a much greater deduction must be made from the effective horse-power, inasmuch as the case of water issuing into water is very different from that of water issuing into air.

Mr. Gravatt's grand point is his *assumption* that "the counter-pressure of an effluent stream of water is double the pressure of the column of fluid due to the velocity," for which he adduces the high authority of Newton.

But how does he prove it? He takes the particular case of a vessel of a square section, such that the sections are proportional to the square roots of their distances from the upper surface (in which case the velocity of the water in the several sections will vary in the same proportion); and calculating the contents of the figure, discovers them to be double the contents of a column whose base is the aperture in the bottom of the vessel, and height that due to the velocity. From this conclusion Mr. Gravatt infers that the reactionary pressure of an effluent stream is double this column. We fear that the connection between this conclusion and the inference, however clear to Mr. Gravatt, will not generally be deemed very satisfactory.

He gives another demonstration of the same supposed fact, independently of any law of fluids, which is, in its way, one of the most remarkable mathematical curiosities we ever *remember to* have encountered. It would be time wasted to allude to it further here. We

may merely remark, that he first supposes a mass moving from rest to be acted on by a force so as to *acquire* a certain velocity, and then assumes, that two such masses combined "might form a continuous cylinder 32 feet long, *moving uniformly* at the rate of 32 feet per second." These two suppositions manifestly imply a contradiction.

Mr. Gravatt also tests his theory by obtaining two expressions, one for the *cause* and the other for the *effect*, and finding them identical, congratulates himself on the corroboration thus given to his investigations.

By the *cause*, he understands whatever has produced the bringing of the influent water to rest, and raising it to the higher level.

By the *effect*, he understands the whole effects produced by the water which falls from this higher level, and flows out at the stern.

Each of these he finds to be measured by

$$\frac{a_2}{64}(v_2^2 + v_2 v_1^2)$$

which ought, by-the-bye to be

$$a_2(v_2^2 + v_2 v_1^2).$$

Now one half of the whole *vis viva*, which is a proper measure of the whole effect that can be produced $= a_2 v_2^2$, and his effect exceeds this by $a_2 v_2 v_1^2$, which is manifestly absurd.

The whole effect must be $a_2 v_2^2$, or $a_1 v_1 v_2^2$, and neither more nor less.

The work expended in bringing the influent mass $a_1 v_1$ to rest and raising it to height $h_1 = a_1 v_1^2$, the work expended in raising this mass from height h_1

$$= \frac{v_1^2}{2g} \text{ to } h_2 = \frac{v_2^2}{2g} \text{ is equal to } a_1 v_1 (v_2^2 - v_1^2).$$

Hence cause $= a_1 v_1 (v_2^2 - v_1^2) + a_1 v_1^2 = a_1 v_1 v_2^2 =$ effect as before.

Mr. Gravatt, evidently, is an earnest believer in the truth of his theory: and for this reason we have taken the trouble of showing that our theory answers the test he proposes of separating the cause from the effect equally with his own, with the additional advantage of not giving a greater measure of either than the real state of things admits of—which we conceive to be no slight corroboration of its truth.

We are convinced that any person conversant with the true principles of mechanics and hydrodynamics will have no difficulty in coming to the conclusion that, for the reasons we have assigned, Mr. Gravatt's theory is only partially founded in truth, and his proposal to propel vessels in such a manner unfit to be entertained; since to obtain efficiency without enormous sacrifice of space entails a very great loss of power, and consequently of economy also.

BETHUNE'S PRETENDED IMPROVEMENTS IN STEAM NAVIGATION.

To the Editor of the Mechanics' Magazine.

SIR,—There is a remarkable article in a late number of the *Journal of the Society of Arts*, on the subject of Improvements in Steam Navigation. It is written by a Mr. Bethune, who has patented certain improvements in building steamers, and the article referred to contains his estimate of his own invention, the modesty of which estimate is on a par with that observable in some of the extracts you lately made from the *Scientific American*. In fact, the whole article may be safely classed with those long advertisements of Parr's Life Pills, Holloway's Ointment, &c., which, from their being treacherously mixed with the more tolerable matter of some of our papers, one sometimes finds himself reading unawares. The fact that Mr. Bethune has induced the editor of the *Journal of the Society of Arts* to insert his production, without prefixing, as is usual in such cases, the warning which the word "(Advertisement)" implies, constitutes the curiosity of the matter. There is something wrong evidently. Nevertheless, viewing it as one of a very large class of productions, I think your readers will not find it either unpleasant or unprofitable to glance with me first through the article, then at the invention. And neither pleasure nor profit will be diminished by perceiving that the present instance has some peculiarities of its own which are quite facetious.

The preliminary remarks are intended to embody the following very common species of argument in the cases of new-born inventions that are designed to change the whole system of civilisation, and to give rise to a new era in the world. Whether the author regards it as an invincible syllogism or as a deep sophism, I do not know. Here is the argument epitomised:

1st. All those great and useful inventions

which, like the printing-press, the railway, the electric telegraph, have proved of inestimable value in the service of progress, have met with the most eager opposition from people prejudiced or interested against them.

2nd. Mr. Bethune's improvements in ship-building have met with this opposition.

3rd. Therefore Mr. Bethune's method of building steam vessels, like the mechanical masterpieces above mentioned, must one day be recognised as one of the triumphs of modern science and invention.

This argument is not, I believe, generally regarded as conclusive, for it is thought by some to urge the mind of a right-thinking man in exactly the opposite direction. They say it has been used in the attempts to bolster up so many quackeries, that the chances are, when its aid is sought for any novelty, that the invention will prove an entire failure.

But let Mr. Bethune say something for himself:

"Do we not hear now, from interested parties, the same cry against proposed improvements in the speed and accommodation of steamers, that we, in years long gone by, heard against the railway and its advantages? Is not the same feeling of *personal interest* at work now to prevent any great and striking improvement in steam-ships as it was formerly against railways? Surely it is. The writer of this paper has met with such universal opposition from all persons connected, as owners with steamers, to his improved plan of steam-ship, by which a speed of not less than 21 miles, and probably 25 miles an hour, or more, can be attained, that he feels no hesitation in asserting that the feeling of private interest is as strong against any great improvement in the speed of steamers as it was formerly on the part of interested parties against our railway system."

Mr. Bethune's steamers are to banish "consumption" from the face of the earth. "Instead, then, of being exposed to the inclemency of the weather upon deck, and of being drenched with spray or rain, as passengers now generally are in crossing the Channel, and of being compelled to travel in wet clothing for some miles by rail, thus laying the foundation of the catarrhal and consumptive diseases which carry off their yearly thousands of victims, passengers in my steamers will arrive at their destination free from such exposures, and without sustaining a loss in the destruction of wearing apparel perhaps equal to five times the passage-money!"

The author says that, in Canada, the use of steamers having one of the features possessed by his plan, viz., upper spar-decks, has sensibly diminished the frequency of violent storms on the lakes.

"* * It was supposed that no steamers with such top hamper could live upon Lake Ontario in a gale of wind; for the sea there is very similar to that in the German Ocean. Experience, however, has proved that the fears of those who predicted their unsuitableness were altogether groundless. At that time storms were of very frequent occurrence, and steamers built with flush decks, and having all snug below, were often compelled to remain in port, or obliged to put back, owing to stress of weather. *Now, however, we never hear of a steamer, built with a spar deck, being obliged to put back or to remain in port from the inclemency of the weather; and the dreadful storms of former years are seldom heard of now.*"

Here is a liberal offer from one who has not the ability of trying the experiment himself, and whose only recipe for producing faster ships is, *make them deeper, narrower, longer, and stronger.*

"It may not be uninteresting to remark, that the cost of a steamer that could carry as many troops as the *Himalaya*, and at a speed exceeding that of that vessel by 100 miles a day, will be at least *one-third* less than the price paid by the Government for that steamer; and that I am prepared to contract, in connection with eminent ship-builders and engineers, for the construction of one or several steamers whose speed will be guaranteed at not less than 17 knots an hour. Although we limit the guarantee to 17 knots an hour, we do not the less expect a speed exceeding 18 knots an hour; for it must be obvious that a prudent builder will allow himself an ample margin in the rate of speed to prevent loss on his part."

I wonder who the prudent builder is who would undertake such a contract. I think he will prove difficult to find. But let us now turn to Mr. Bethune's invention, as exhibited in the specification of his patent, which I have before me.

The means adopted by Mr. Bethune to obtain such wonderful results will, no doubt, appear to those acquainted with ship-building, somewhat unadapted to produce them. In his specification he says:

"This invention consists in a new and peculiar mode of constructing ships, so as to give them greater strength amidships, or, in other words, at that part where the greatest strain takes place, and which part in ships, as hitherto constructed, is usually the weakest, particularly in vessels propelled by paddle-wheels placed at the sides thereof. And further, by this invention I am enabled to build ships of greater length in proportion to the width of beam than heretofore; and by strengthening the sides of

the ship I am enabled to employ paddle-wheels of considerably larger diameter, by which, in combination with greater length, I obtain greater speed. And I effect these improvements by constructing the sides of the ships in the following manner. Instead of making the top of the sides of a ship straight, I form the sides thereof strongest at those precise parts (where the main driving-shaft is situated, by making such parts higher than the other parts of the sides, in the form of a solid arch; and in building iron ships I rivet the sheets of metal together which form such arch, and I connect the upper edge thereof to a strong bar of wrought-iron, so that the strain is distributed over the greater portion of those parts of the sides which would otherwise be too weak in proportion to the extreme length of the ship; and it is this peculiar mode of constructing ships which constitutes this invention of improvements in the construction of vessels propelled by steam or other motive power."

Professional men will have some difficulty (arising from the prejudices they have contracted, according to the inventor,) in perceiving the connection between 25 miles an hour and a strake of thick stuff worked round the heads of the frame-timbers, which in a wooden ship form the inside framing of the paddle-box, and continued down forward and aft in the manner of a truss.

But let us give the inventor credit for all the little plausibility with which he has succeeded in endowing the method. Sharpness is a very important facility in the speed of a ship, and the sharper we make the vessel the more must we diminish the ratio which her breadth bears to her length. But as we diminish this ratio, while we keep that of the depth to the length constant, we diminish the capability of resistance to any force acting to destroy the rigidity of the vessel; so, in order to preserve this in its desirable amount, we must in some way supply this longitudinal strength. Thus, I imagine, Mr. Bethune reasons; and we have seen his results. Having conceived a method of strengthening, to some unknown extent, the sides of his vessel, he begins to draw upon it unlimitedly. In the first place, he intends to make his ship very much longer than usual; secondly, to apply to her paddle-wheels unusually large in diameter; thirdly, to employ much greater power in proportion to tonnage; and fourthly, much less draught of water will be required. These improvements entitle him (the inventor thinks) to be ranked with the great Watt, with Stephenson, and with Wheatstone. I think the few on whose attention the *Journal of the Society of Arts* has given the inventor an opportunity of forcing his invention, will seek him out a place in their esteem far below Ericsson, Lipscombe, or Planavergne.

Mr. Bethune seems unaware of the extreme importance of some of the reasons for giving a vessel a considerable breadth, and for keeping her depth within reasonable limits. In the first place, a vessel must have breadth to enable her to resist all the forces which tend to alter her lateral form: she must have breadth to enable her to resist torsion: and, above all, she must have breadth to give her stability. That ships built according to Mr. Bethune's specification would be wanting in this last quality, there is no room to doubt. For he intends not only to diminish the ordinary breadth, but also to make his ships much higher than usual, and to build them with top hamper of enormous weight, and at the same time he purposes that they shall draw very much less water than is ordinarily done. Now all these processes are admirably and clearly adapted to diminish the stability of his vessel and make her totally unfit for any service whatever. Then, to make her failure still more sure and still more apparent to all his readers, he states his intention of placing engine work of unusual power, and, therefore, of unusual weight, at a height also much greater than any kind of experience has ever sanctioned, or is ever likely to sanction. Those properties with which Mr. Bethune would endow our modern steamer, are just those which a prudent builder will carefully avoid. For vessels built in a manner differing very little from what has been warranted by experience, have lately been found lamentably wanting in the quality of stability. Most people will, I think, perceive that it is important that there should be some assurance attainable, when we put even merchandize of great value on board a vessel, that she will continue always to float the same side uppermost; and this is of infinite importance when such a vessel is used for the transport of troops, or for the conveyance of those stores on which our armies depend. In the case of a ship built after Mr. Bethune's design, we should not be sure from one minute to another which part of her body she would determine to immerse, and which to present towards the clouds. Indeed one would feel a great deal of surprise if she were to remain floating in any position except she were built on a revolving principle, and allowed to choose her own position of equilibrium.

Sir, I must beg you to excuse me, if you deem I have said more than is needful on a subject so intrinsically worthless as these improvements. My apology is the promi-

nence given it by a journal which *ought* to have some authority, and be, to some extent, a judge in these matters.

I am, Sir, yours, &c.,

J. C.

Deptford, Jan. 30, 1855.

ON THE MOON'S ROTATION.

To the Editor of the Mechanics' Magazine.

Sir,—The letter of Mr. Recordon, which you publish this week, only re-opens the question of the moon's rotation in a slightly different form. I, as an Englishman, and not entirely unversed in scientific pursuits, have felt acutely and painfully, during the late discussion, the miserable conviction of how low the state of science is in this country. A controversy on the patent fact that the moon rotates on her axis! And now Mr. Recordon comes forward to complicate errors still more; and, by an abuse of philosophic terms, to give countenance to the fatuitous disbelief in the above fact on the part of Messrs. Evan Hopkins, Mushet, &c., &c. It sounds very fine indeed to talk of the dynamical relation in which bodies stand to one another, and to enumerate "general and important principles" on this subject. I should have been much better satisfied with the exhibition of a knowledge of sound dynamical first principles; and I am sure your readers will have derived more profit than they can possibly do now from the perusal of Mr. Recordon's letter. What proper notion can be affixed to such a sentence as this? "We now perceive clearly the possibility of the moon's motion as it occurs in nature, *without the necessity of admitting that it has a centre of gravity with regard to the earth?*"

The explanation on which this grave announcement is founded is simply erroneous. Like many, who are but tyros in physical science, Mr. Recordon confounds centrifugal force with the impressed force actually exerted on a body, in this case the attraction of the earth. A force equal and opposite to the centripetal force to the earth's centre, he tells us, is necessary for the "moon's stability;" and this he calls her centrifugal force. Why, if such a force were really to act on the moon, she would then be under the influence of two equal and opposite forces, whose resultant zero she would move in a straight line, and could not move as she does in an orbit nearly circular.

The term "centre of gravity" is applied to denote a certain point in all heavy bodies, totally irrespective of the external forces by which they are acted upon. The moon's centre of gravity, with regard to the earth, is, according to the usual language of science, which ought never to be departed from, simple nonsense. So long as the moon is symmetrical with respect to the axis about which she rotates, or rather with respect to the diameter at right angles to the plane of her orbit, so long it may be demonstrated that the attraction of the earth can produce no effect whatever in impressing a motion of rotation about any axis, and, of course, not in altering such a motion. For, referring to Mr. Recordon's letter, page 83, allowing Q to be the point at which, if the whole attraction of the earth were applied, it would produce the same effect as is actually the case; the direction of this force passes through C, the moon's centre, and can therefore cause no rotation about it. The rotation of the moon about her axis is just what it was at the time she was launched into space under her present conditions, and no force has acted to modify it in any manner. She might, like the earth, have had a quicker motion of rotation impressed, and the motion of her centre of gravity with regard to the earth would have been just the same as it is, and nothing else.

I emphatically deny that "the rotation of the moon on its axis, in the sense hitherto given to these words, appears to be a mere consequence of its revolution round the earth, and not an *independent* motion." There is not the slightest shadow of a proof of this in anything that Mr. Recordon has said. On the contrary, he has shown (if he has shown anything) that the attraction of the earth can impress no such motion. I will enunciate to him a dynamical principle of far more importance and direct application to the matter in hand than anything he has brought forward. It is this: "the principal axes of a body passing through the centre of gravity are permanent axes;" *i.e.*, if he requires explanation, any motion of rotation impressed about such axis will continue uniform and undiminished so long as no force acts to retard or check it. The moon has had impressed upon her a motion of rotation by which she revolves about one of her principal axes once in a lunation. The earth's attraction exerts no force to interfere with this. Hence the moon continues, and, so long as the circumstances in which she is placed remain unchanged, will continue to revolve about her axis uniformly in the same period.

"To define the moon's motion independently of the libration and of the eccentricity of the orbit, by saying that the moon revolves about the earth's centre as if it were rigidly connected to that point," is a mere *geometrical illustration*, and describes the result of the combination of the

two motions impressed on every point in the moon, but is in no sense a *physical or philosophical interpretation or explanation* of such motion.

I sometimes wonder what foreigners (I do not mean Americans, who are too much like us) think of the scientific attainments of the majority of the readers of those English journals which are open to the discussion of such subjects as the foregoing, when they see the wonderful theories gravely asserted and maintained by many of them! A very intelligent French engineer, sometime pupil of the École Polytechnique, probably formed his judgment from some such course of reading, when he told me, that in England the great evil was, that all science was merely skin-deep. If this be the result of our Mechanics' Institutes, popular lectures, &c., &c., the sooner we return to the old method of learning science, by hard research, burning the midnight oil in painfully toiling our way through the works, written with labour and to be read with labour, of our great philosophic lights, the better.

I am, Sir, yours, &c.,
INDAGATOR.

London, January 30, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—Though the process be somewhat mysterious and recondite, I am glad to perceive that Mr. Recordon arrives in his last paragraph at the correct conclusion that the moon revolves round the earth's centre as if it were rigidly connected with that point, and that it would be more rational to apply a different language than that hitherto used respecting this rotation. His sentence is, in fact, the sum and substance of my own arguments. The moon floats round the earth's centre in her orbit precisely as a ship floats in a smaller circle round that same centre when circumnavigating the globe. I certainly must now be encouraged, by this abstruse investigation, to record my own plain English pleadings to the same point in due *formâ auctoris*. The *cause* of this motion is a distinct and different question, involving other investigations, but I conceive no one but an infidel ever attributed it, or any other great natural phenomenon, to "accident." That imbued with appropriate elements of buoyancy, this lunar globe sails onwards in its trackless path by the force of a magnetic current generated by the twenty-eight co-rotations of its primary, there seems no reason whatever to doubt. This is the view of the planetary motions explained in the treatise to which I have before referred; and your correspondents scarcely seem aware that since its publication Sir John Herschel has publicly adopted the opinion. The laws of magnetism coincide exactly with the mathematically calculated laws of gravitation; therefore these interesting studies are not disturbed, but fully confirmed, by the substitution of a *vera vis viva* for an assumed constant, which involves the necessity of the impossible fiction of a perpetual motion engendered by one solitary impulse. On the contrary, nothing can place the original grandeur of the Newtonian conceptions in a brighter light, than when a mere idea is seen to be supported by facts, the discovery of which was not then even dreamed of. He proved a force diminishing in intensity as the square of the distance, and such a force is in reality constant and undiminishing, because it weakens not by *loss* but by *expansion*, filling up as it radiates an area always the square of the distance it has progressed. There is the same amount of force in the increased area, but proportionally less intense, and this is the law of the magnetic energy. Magnificent, indeed, is the field of research thrown open by the coincidences of the law of magnetism and gravitation. Losing nothing by its progress through any measurable distance of space, the power recovers all its pristine vigour upon re-entering an appropriate pole of recondensation and concentration. With what ardour would Sir Isaac Newton hail the marvellous developments achieved by electro-chemistry since his day. How little did he dream, that in the trifling and curious loadstone was indicated and yet concealed the key to his whole system of the universe. The epochs of great difficulty in the progress of science have always been those of transition, involving the hard task of reconciling old data with new truths. Kepler, Copernicus, Galileo, had a whole world of past ideas against them. Bacon had to conjure to rest the giant phantom of the Aristotelian logic, with all its innate faculties. Our chemistry was born in the triumph of Lavoisier over Scheele, and yet here again the *too* strict adherence to *one* acidifying principle, rendered Berzelius so long the antagonist of Davy. Nay, was not even Watt's steam-engine opposed on all hands, even upon religious grounds, as an innovation too powerful to be suffered? "When ye think ye stand, take heed lest ye fall," is a caution well applicable to scientific studies. We may be sure that error is mixed in all the truths laid down by finite beings. No source of error is so fertile as prejudice and habit, and great minds should be constantly on the alert to look out the dead wood in our trees of philosophy, which, antiquating for centuries, checks and chokes by its

accumulation the young and lively shoots from bearing fruit to truth.

I am, Sir, yours, &c.,
DAVID MUSHET.

January 29, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—I perceive that I unfortunately made a serious oversight in my last paper on the above subject, for which I must beg your and your readers' pardon.

In the fourth paragraph, instead of "we admit that the moon revolves round the earth, so that the same points A, B, D, C, &c.," it should be,—we suppose the earth to be at rest, and the moon to revolve round it (without rotating on A C produced as axis), so that the same three points A, D, C, &c.

My paper was only intended to be a sketch of a theory, but I intend giving soon a more full explanation of its chief points.

I am, Sir, yours, &c.,
C. J. RECORDON.

MR. WILLIAMS'S METHOD OF PREVENTING SMOKE.

To the Editor of the Mechanics' Magazine.

SIR,—In your number of this day I find a letter from Mr. Baddeley, whose several communications through your columns give him a strong claim to attention. I am desirous, therefore, of removing some misapprehensions on his part, in reference to M. Parker's furnace (see your number for Nov. 4th), and to my suggestions for promoting combustion in furnaces.

Mr. Baddeley observes: "Mr. Williams has admitted the principle of perforated air distributors to have originated with Mr. Argand, who applied that principle to the well-known lamp which bears his name." Now, I have made no such admission, as Argand did not apply that principle to his lamp. In truth he made no attempt of the kind. The principle (not of Argand's lamp, which was an oil lamp, but, as applied since his time, to the use of gas) was, not the regulating the *admission of the air*, but regulating the *exit of the gas*, by means of numerous small apertures. It was the effect produced, namely, the rapid mixture of the gas with the air, that led me to regulate the admission of the air, in furnaces, through numerous orifices—mixture being the great desideratum.

The distinction between my process and that in the Argand gas burner, is clearly indicated by Professor Brande (see his letter dated 26th Nov., 1840). "Each jet of air," he observes, "which you admit, becomes, *at once*, the source and centre of a separate flame; and the effect is exactly that of so many jets of inflammable gas ignited in the air [as in the Argand burner]; only, in your furnace you invert this ordinary state of things, and use a jet of air, thrown into an atmosphere of inflammable gas: thus making an experiment upon a large and practical scale, which I have often made on a small and theoretical one." Now, this precisely applies to Mr. Parker's air distributor. The important difference. then, between my process and what is done in the Argand gas burner is, that in the latter, it is *the gas* that is dealt with, and put under control, whereas, in my plan, it is *the air* that is dealt with and regulated.

Mr. Baddeley says: "Mr. Williams claims to have invented and patented a peculiarly constructed furnace, to which he gave the name of the 'Argand furnace.' This also is a misapprehension. I have neither claimed or patented any peculiarly constructed furnace. What I patented and claimed is applicable to all furnaces, or wherever coal is employed. For instance, among many, may be mentioned the large stoves in which masses of iron and large boiler-plates are heated, the air being introduced through numerous perforations in the side; and where it is thus brought, in a divided state, into contact with the great mass of gases in the stove, then in the state of flame, and by which perfect combustion is at once effected, and without smoke. My stove has been in action for many years, and is, I believe, the most efficient in the kingdom.

Again; I did not give the name of *Argand* to my mode of introducing the air. That name was given, and by another, many years, I believe, after the patent was sealed in 1839. In truth the word *Argand* does not appear in my patent or specification, and has only been used by me in illustration of the effect produced.

Mr. Baddeley says, "The *mechanical construction* and arrangement of the furnace, not the *principle of its action*, being the invention, and constituting the patent right of Mr. Williams." This, again, is a misapprehension. If Mr. Baddeley will consult any legal friend conversant with patent law, he will find that a "*principle of action*" cannot be the subject of a patent; but that it is for *the mode* by which a principle is carried out, and not *the principle* itself, that the patent must be taken. In my case my claim necessarily was, not for "the principle of action," but for the *specific mode* by which I proposed to carry out the principle, and which principle was the "causing the atmospheric air, and the combustible gases generated, to be more immediately and intimately blended;" and so it was stated

in the specification, as settled by Dr. Ure. Now *the mode* adopted by Mr. Parker is identical with that stated in my specification as above.

Mr. Baddeley speaks of considerable expense and time being required in the application. This is, practically, the reverse of the fact. As an instance of recent date, I may refer to the application of the air distributors in the furnaces of the *Llewellyn* contract mail steamer, in which the expense or the time was so insignificant as not to be worth noting. When the last edition of my treatise on combustion was published, the perforated plates were applied to the after set of boilers (see page 114.) The application has since been made to the six furnaces of the fore set of boilers, and with equal success.

Mr. Baddeley observes, that "no refined question of chemistry is at issue, neither is the claim of Mr. Williams to the Argand furnace disputed." I do not understand what is meant by the term "*refined* question of chemistry." The chemical union, which is combustion, is the same in all cases; and Mr. Parker's mode of introducing the air, *through perforations*, being identical with that adopted by me, as regards chemistry, it must be equally applicable in the one case as the other.

As to the mode which Mr. Parker considers his special invention, if Mr. Baddeley will refer to page 92 of my treatise, figs. 39 and 40 (a copy of which I beg to forward, through you, Sir, for that gentleman's acceptance), he will there see it given as an illustration of the fact, that the air may be advantageously introduced into any part of a furnace, and on which point he will, at page 91, find the following: "With reference *to the place* for the admission of the air, it is here stated advisedly, that it is a matter of perfect indifference, as to effect, in what part of a furnace or flue it (the air distributor) is introduced, provided this all-important condition be attended to, namely, that the *mechanical* mixture of the air and the gas be continuously effected before the temperature of the *carbon* of the gas (then in the state of flame) be reduced below that of ignition."

I trust I have sufficiently removed the misapprehensions on the part of Mr. Baddeley. If not, I shall be happy to afford any further explanation that may be necessary.

I am, Sir, yours, &c.,

CHARLES W. WILLIAMS.

Liverpool, Jan. 27, 1856.

ON THE COMBUSTION OF COALS AND THE ABSORPTION OF HEAT.

To the Editor of the Mechanics' Magazine.

SIR,—Your most valuable and instructive journal has for some time back contained so many learned expositions on the consumption of smoke, and letters disputing the preference of the hot or cold air systems, to be introduced in various ways in small films to inflame the smoke issuing from the furnace, that it appears as if the only object of the proprietors of steam-boilers was to consume or destroy entirely the smoke produced by imperfect combustion, by any means, *coûte qui coûte*, to obey literally the wise and beneficial law; the spirit of which, however, is to direct the attention of builders and proprietors of steam boilers to improve the combustion, and by it increase the generation of steam, economise their coals, and abate or reduce the issue of smoke so far that it could not be called a nuisance. The problem to be resolved should not be, how to consume the smoke produced, but how to prevent smoke issuing at all. Having in vain made inquiries about works treating on the important objects named at the head of my letter, and finding that not a single boiler is constructed on land or water with a view to a complete absorption of heat, and that even the principles of the most complete absorption appear to be unknown or not attended to, and that therefore in the best possible Argand furnace, in smoke or in flame, a very large quantity of heat and coals is wasted through the chimney, I have considered it my duty to give the benefit of my long researches and practical experience in a treatise about to be published to the industrial world, and to expose the theories of production and absorption of heat from time to time in your Journal, if found agreeable. My object is to draw the attention of your readers and proprietors of steam boilers to the fact, that as economy in coals, and quick and copious generation of steam, must be their principal objects, they should, as a criterion of the value of any patented invention, claiming improvement in combustion, or in preventing or consuming smoke, first inquire how much water would be evaporated from 1 lb. of coals? I am not a disinterested person; and as Mr. Williams claims the priority and preference in all smoke-avoiding schemes through the introduction of atmospheric air in small films, I claim the preference in improved combustion and absorption of heat, and will undertake to evaporate about 12 lbs. of water from 1 lb. of West Hartley coals in 12 seconds. I enclose the testimonials, showing that I have practically done it, from coals of an inferior quality, and less

in proportion. Yet, I challenge any one to do the same, without using the principles and modes of my two patented inventions of the undulated firegrate and metallic flues, of the latter of which I gave an explanation, inserted in your last Number, on "The Prevention of Incrustation in Boilers," which at the same time shows it to be the best possible means for obtaining the absorption and utilisation of heat. Without mentioning parties' names, I will enter into a comparison between quick and slow combustion. In the latter the entire destruction of smoke appears to be the only and principal object to be arrived at, by the use of costly machinery, and with great expenses for boilers and waste of coals. My object, which I have successfully attained, is, to produce in the shortest time the greatest volume of steam with the greatest economy in coals, feeding by hand, without machinery. By a calculation made on information received by good authority, the generation of steam on the slow-burning system, with the use of small coals, is so diminished that three boilers, with the patent apparatus and machinery, are required to produce as much steam power as I can produce from one boiler, without machinery, but provided with my undulated firegrate and metallic flues, using good West Hartley coals. If coals of an equal quality are used in both systems, I can still produce from one boiler as much steam as they can from two, with the saving of one-third part in the cost for fuel; this shows that, like gold, the entire destruction of smoke may be too dearly purchased. The immense economy of the rapid and improved combustion against slow burning with small coals is evident; two boilers, of equal size, and their wear and tear, and two apparatus and machinery are saved. The expense of my undulated firegrate, with hollow bars and the metallic flues, is about the same as one apparatus on the slow-burning system. I can prove the truth of this assertion; and even if I had not a right to speak of the advantages of my invention, in comparison with another in direct opposition to my system, it too much concerns the public benefit for me to keep it concealed from personal regards. I will only say a word about perfect combustion, and then leave this new view of the smoke question to the consideration of your scientific readers. One of your most zealous scientific correspondents says, in one of his letters, "The power of effecting a more intense and rapid combustion is just the desideratum we are in search of;" but may I not be enabled, by the foregoing assertions (which you know, from my enclosure, are true), to claim the honour of having already discovered and practically carried out this desideratum to a certain degree? Unluckily, circumstances have prevented my bringing it to the general knowledge of the public, and very few persons know it; yet I may be permitted to conclude by claiming also the first discovery and adoption of a principle by which really *perfect combustion* is effected. I call it perfect combustion, if I can change the coals, without the issue of any smoke, into white flames, without introducing any other atmospheric air whatever than that which passes through the firebars in the burning coals. I have practically done that under the protection of my last patent, obtained for improvements in furnaces and ovens for bakers and confectioners. I prove it to you by the certificates from two highly respectable bakers in London, and this is coupled with the saving of half the fuel, and other advantages. In asking your pardon for having occupied such a large space of your valuable Journal, which is the only one that allows the patentee inventor to communicate the results of his experiments to the public,

I am, Sir, yours, &c.,
ANTHONY B. VON RATHEN.

4, Crescent-place, Blackfriars,
Jan. 31, 1855.

BLACK SEA TELEGRAPH CABLE.

THE facility with which the operations of the Gutta Percha Company are at present conducted at the Wharf-road Works, has lately been exhibited in a remarkable manner in the preparation of the cable for the Black Sea Telegraph, the whole 350 miles of which were covered *within fifteen days* of the receipt of the order from Messrs. Newall and Co., the contractors.

ASTRONOMICAL CLOCKS.

To the Editor of the Mechanics' Magazine.

SIR,—I shall feel obliged by any of your correspondents, familiar with the subject I am about to mention, if they will be good enough to suggest a contrivance by which the difficulty it involves may be obviated. In few words, I require a piece of apparatus which may be attached to an astronomical clock for the purpose of registering the second and tenth part of a second at which a star or other object may pass the wires in transit observations.

One or two modes of effecting this have occurred to my mind, but of so complicated a nature as to be questionable in their results, or inapplicable to the conditions of the case.

I have heard of the electro-galvanic

plan exhibited by an American artist, but I was not so fortunate as to see it at the Exhibition of 1851; and, from the account I have received of it, conclude the clock itself was peculiarly constructed to the end in view. Simplicity, I take it, must form an essential element in such a piece of machinery as I have indicated.

I need scarcely say that the clock to which it is required to attach this apparatus is of the usual kind—dead beat escapement, and one second pendulum. The number in the escapement wheel pinion is high, but I am unable at present to state the number of its leaves.

Trusting that you will oblige me by inserting this in your valuable Magazine,

I am, Sir, yours, &c.,

C. M.

London, Jan. 25, 1855.

MR. C. WYE WILLIAMS ON COMBUSTION.

To the Editor of the Mechanics' Magazine.

SIR,—Since writing my renunciation of the "league," it has occurred to me, that the very best way of settling the matter therein referred to, would be for Mr. Williams to forward for the columns of your widely circulated Journal the paragraph in correction of the error, which was submitted to my approval, with the view of having it printed and bound up as a supplementary page to the last edition of the work on Combustion. The error is of incalculable importance, and not the less injurious, while it remains uncontradicted, from having been originally the mere fruit of accident. Its correction in your columns will go far to redeem the promise given me, that every possible public reparation should be made; and as I entertain perfect confidence in the *bona fides* of Mr. Williams, and the spirit of candour which pervades his writings, I can have no doubt that he will gladly avail himself of this my present suggestion.

I am, Sir, yours, &c.,

DAVID MUSHET.

January 29, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BEARD, GEORGE, and WILLIAM BEARD, both of Cannon-street, London, pin and needle-manufacturers. *An improved needle-depositor.* Patent dated July 7, 1854. (No. 1495.)

This invention consists in so constructing a machine for depositing needles, that they may be readily examined as they are placed in the packing papers.

NORTON, JAMES LEE, of Holland-street, Blackfriars, Surrey, gentleman. *Improvements in turnstile counting apparatus.* Patent dated July 7, 1854. (No. 1498.)

The inventor curves the arms of turnstiles in order to allow only one person to pass through at the time, &c.

ELLISDON, JOSEPH, of Liverpool, Lancaster, designer and cabinet-maker. *Improvements applicable to reading, lounging, and other chairs.* Patent dated July 7, 1854. (No. 1499.)

The inventor forms the seat and back (and arms when arms are required) together in one piece, which he mounts upon the lower portion of the chair, which consists of a stout frame, supported by and attached to legs of a suitable height. The upper and lower portions of the chair are connected in such a way that the former is free to rotate horizontally upon a pivot or friction-rollers.

COTTAM, HENRY RICHARD, of Argyle-square, King's-cross. *Improvements in horse-mangers.* Patent dated July 7, 1854. (No. 1500.)

The inventor causes the halter to pass between two rollers, and the weight attached to it to slide in guides, instead of swinging loose, as usual.

WALLER, THOMAS, of Ratcliffe, Middlesex, ironmonger. *Improvements in the construction of stoves and other fire-places.* Patent dated July 8, 1854. (No. 1501.)

This invention consists in a mode of lining stoves or fire-places, in which the back fire-tile is fixed, and the side ones moveable or otherwise; in a certain arrangement of the bars and hobs; and in sometimes dispensing with a portion of the fire-bars.

ROBINSON, WILLIAM, of Manchester, Lancaster, screw-bolt maker, and ROBERT CRICHTON, of the same place, engineer. *Improvements in machinery or apparatus for rolling metals into suitable shapes or forms.* Patent dated July 8, 1854. (No. 1502.)

Claim.—"The use of rollers, in rolling machines, with their surfaces or peripheries formed so as to give the object passing through them the form or shape required, as hexagonal nuts, or similar articles."

TINDALL, LORENZO, of Scarborough, York, ironmonger. *Improvements in bruising or reducing grain and other substances.* Patent dated July 8, 1854. (No. 1503.)

Claim.—1. A mode of bruising or reducing grain, and other matters by means of a ribbed or serrated cylinder working in contiguity with an adjustable serrated bar. 2. A mode of guiding or directing the grain down to the disintegrating surfaces, by means of a recessed or inclined bar, or guide surfaces. 3. The application of a holding recess or space, for keeping the grain or

other substance, well up to the grinding action.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of carbonates of soda.* (A communication.) Patent dated July 8, 1854. (No. 1504.)

Claims.—1. The use of fuel gases, or the gaseous products arising from the combustion of fuel, for the obtainment of pure, or nearly pure, carbonic acid gas by applying the said fuel gases under pressure to soda and potash, and to the carbonates or solutions of these matters, so as to form highly carbonated compounds from which pure, or nearly pure carbonic acid gas is evolved by the agency of heat. 2. The use of fuel gases in procuring comparatively pure carbonic acid gas by applying the said fuel gases under pressure to water or to solutions, so that comparatively pure carbonic acid gas may be obtained when the water is withdrawn and released from pressure, or when such impregnated water or solutions are heated. 3. The use of fuel gases under pressure, as before described, directly to the decomposition of the salts of soda by the reaction of ammoniacal compounds, such pressure being about sufficient for the production of such an atmosphere of carbonic acid gas as shall present any material solatilization of ammonia, &c.

SINCLAIR, the Honourable JAMES, commonly called Lord Berriedale, of Hill-street, Middlesex. *Improvements in the manufacture of paper, and in the production of textile materials.* Patent dated July 8, 1854. (No. 1505.)

Claims.—1. The use of the thistle plant, or plants of the thistle species, for the obtainment of fibrous materials to be used for the manufacture of paper. 2. The use of the thistle plant, or plants of the thistle species, in the manufacture or production of textile materials.

BAUWENS, FELIX LIEVEN, of Pimlico, Middlesex, manufacturer. *Improvements in the manufacture of soap.* Patent dated July 18, 1854. (No. 1506.)

This invention consists in peroxidizing any oxide of iron that may be present in neutral or acid fatty matters undergoing the process of saponification, by the injection of atmospheric air or oxygen, and then removing the peroxidized iron by the aid of a solution or infusion of tannic or gallic acid, or any other acid or principle capable of combining with the peroxidized iron. The process of soap making is afterwards finished with the purified materials in the ordinary manner.

WHITWORTH, THOMAS SCHOFIELD, of Salford, Lancaster, mechanic. *Improvements in machinery or apparatus for cutting or shaping wood, parts of which are particularly applicable in the construction of spinning-machinery.* Patent dated July 8, 1854. (No. 1507.)

This invention consists mainly in the use of drilled holes or other openings in the material to be operated upon as a medium for carrying it forward to receive successive cuts, by which rectangular recesses are formed; and in the combined action of one cutter for piercing the outline of the rectangular cut, and a second for removing the portion so marked out.

SAXBY, STEPHEN MARTIN, of South Lambeth, Surrey, gentleman. *An improvement or improvements in making fast, and letting go, the cords of window blinds, which said improvement or improvements may also be applied to the fastening and letting go of ropes, cords, lines, wires, and chains, for various other purposes.* Patent dated July 10, 1854. (No. 1510.)

This invention consists in the construction of an apparatus for making fast and letting go cords, ropes, &c., formed of a curved plate or roller mounted eccentrically upon an axis, between the edge of which plate and a fixed portion of the apparatus the cord, rope, or chain may be wedged.

BIDDELL, GEORGE ARTHUR, of Ipswich, Suffolk, engineer. *Improvements in machines for cutting vegetable and other substances.* Patent dated July 10, 1854. (No. 1512.)

This invention consists in combining a cam or cams with a friction roller or rollers and a lever, for the purpose of advancing the vegetable or other substances towards the knives.

WOLVERSON, EDWIN, of Aston-juxta-Birmingham, Warwick, machinist. *A new or improved lock.* Patent dated July 11, 1854. (No. 1514.)

This invention consists in attaching to the bolts of locks, plates which have a sliding motion transverse to the motion of the bolts, and which require to be raised to particular heights, respectively, before the bolt can be withdrawn. The plates are raised to the proper heights by means of slides on which the key first acts, and from which they are isolated, except during the motion of the key prior to the withdrawal of the bolt.

WALKER, MATTHIAS, of Horsham, Sussex, ironmonger. *An improved construction of cooking-stove.* Patent dated July 11, 1854. (No. 1516.)

When constructing a stove with a boiler and oven, the inventor so arranges the parts, that the fire is placed between them, and he leads off the heat by lateral openings in the fire-place, one current of heated gas acting upon the boiler, and the other circulating round the oven. The boiler is set at

a higher level than the fire-place, and by means of a flue, the flame and heat are made to pass under it.

HARDING, THOMAS RICHARDS, of Leeds, York, hackle and hackle-pin manufacturers. *An improved mode of doffing fibrous materials from hackle cylinders, and gill, or porcupine, or preparing rollers.* Patent dated July 11, 1854. (No. 1517.)

This invention mainly consists in the use and application of stripper-pins or teeth, which, while in action, are made to travel laterally, so that their points may be kept in the helical lines or grooves of the pins in the porcupine or other cylinders or rollers which require doffing.

CUVIER, VICTOR GUSTAVE ABEL, chemist, of Seloncourt, France. *An improved apparatus, having for its object the combustion of fuel and the utilization of the gaseous products for heating and other useful metallurgic purposes.* Patent dated July 11, 1854. (No. 1519.)

This apparatus, which the inventor denominates "The Hyper-Gazo-Pyrogène," and which is intended for the production of combustible gases from wood, charcoal, peat, &c. &c., or from these solid substances in combination with tar, or oily or fatty matters, &c., will be fully described hereafter.

HOUGHTON, WILLIAM, and ROBERT HOYLE, both of Bury, Lancaster, machine makers. *Improvements in machinery for spinning and doubling cotton and other fibrous substances.* Patent dated July 12, 1854. (No. 1521.)

This invention, which is applicable to self-acting mules, consists—1. In certain improved combinations of machinery for throwing out of gear the catch-boxes by which the drawing-rollers are made to revolve and the carriage made to run out, for stopping the spindles for stripping the yarn off the bare part of the spindles, for working the fallers, and for bringing the carriage up to the roller beam; also in modifications of the same for the purpose of producing after draught for giving twist and for backing off. 2. In the application of an expanding pulley or drum, supported in the carriage for winding the yarn on the spindles. 3. In an improved scavenger for cleaning the flyings or dust off the roller-beam and carriage-top, or either of them.

MAGGS, OLIVER, of Bourton, Dorset. *Improvements in thrashing machines.* Patent dated July 24, 1854. (No. 1524.)

The invention consists in combining elevating apparatus and a weighing machine with the thrashing and winnowing apparatus, in such manner that several successive blasts are caused to act upon the materials under operation.

COOKE, LUKE, of Sowerby-bridge, York, manager. *Improvements in machinery or apparatus for preparing cotton, wool, or other fibrous substances to be spun.* Patent dated July 12, 1854. (No. 1525.)

This invention relates to the blowing machine which is used for opening and cleaning fibrous materials, and consists in placing one or more small beaters under the usual beater and feed rollers, working in opposite directions; the beaters revolve all one way, but the blades at the working parts pass each other in opposite directions.

KNOWELDEN, JOHN, of Church-road, Battersea, Surrey, engineer. *Improvements in steam-boiler and other furnaces.* Patent dated July 12, 1854. (No. 1526.)

This invention consists in arranging the fire-bars of furnaces, so that a portion of them on every alternate bar shall have both an up and down, and a backward and forward motion, whilst the other portion of the bars are either stationary, or have a slight vertical motion, and rest upon bearers, so that the weight of one set or portion of the bars counterbalances an equal weight of the other portion.

GILBEE, WILLIAM ARMAND, of South-street, London, gentleman. *Improvements in the application to weaving of certain textile plants not hitherto employed, either alone or in combination with silk, cotton, and other fibrous substances.* (A communication.) Patent dated July 12, 1854. (No. 1531.)

This invention consists "in the employment of the fibres of the corchorus junceus, corchorus olitoreus, and corchorus capsularis, either alone, combined together, or mixed with other fibrous substances for the manufacture of cloths, carpets, and other fabrics."

LANE, ARTHUR JAMES, of Surbiton, Surrey, gentleman. *Improvements in breech-loading fire-arms.* Patent dated July 13, 1854. (No. 1536.)

The inventor first hinges the breech-piece of the gun to the iron work of the stock which receives the breech, technically termed the break-off, by means of a screw pivot or pin, upon which the breech moves freely. He then connects the barrel of the gun to the break-off, by attaching to or forming upon the breech-end of the barrel on each side a bar of metal with a hole in it, through which screws, entering the break-off, pass.

FOULKES, THOMAS BENNETT, of the firm of Abel and Thomas Bennett Foulkes, of Chester, glove-manufacturer. *Improvements in the manufacture of self-adjusting gloves.* Patent dated July 13, 1854. (No. 1537.)

This invention consists "in the employment of a gore of elastic material inserted

at the wrist part of gloves, known to the trade as gauntlets."

GREENWOOD, JOHN, of Irwell-springs, near Bacup, Lancaster, Turkey-red dyer, and ROBERT SMITH, of Bacup, manufacturer. *Certain improvements in sizing, stiffening, and finishing textile materials and fabrics.* Patent dated July 13, 1854. (No. 1538.)

The inventor employs for the above purposes rye flour, rye flour combined with chloride of calcium or chloride of magnesium, or the latter "mixed with any amylaceous substances."

TRAVIS, EDWIN, of Oldham, Lancaster, cotton spinner and manufacturer. *Certain improvements in machinery or apparatus for indicating the height of water, and also the pressure of steam in steam boilers and generators.* Patent dated July 13, 1854. (No. 1540.)

The inventor describes an apparatus for registering continually the heights of water, in which a float rises and falls in a tube, and, acting upon a band which it tightens, thus produces a partial rotary motion in a wheel, and sets revolving a small drum on the outside of the tube, which drum takes on or gives off a registering band. He employs also a bent mercury tube for registering pressure.

HACKETT, JOHN, of Derby, manufacturer. *A new method of fastening the ends of India-rubber elastic cord and India-rubber elastic web.* Patent dated July 13, 1854. (No. 1541.)

This invention consists in fastening the overlapped ends of India rubber cord and web, by means of a thin piece of metal wrapped round them in a similar manner to that in which a tag is applied to the end of a stay-lace.

BODMER, RUDOLPH, of Thavies-inn, Holborn, London. *The application of glass, crystal, or other vitreous material, or of earthenware (céramique) to certain parts of machinery.* (A communication.) Patent dated July 13, 1854. (No. 1542.)

This invention consists in the application of steps, sockets, or bearings, made of glass, crystal, or other vitreous material, or of earthenware, to all kinds of machinery.

CHAUVET, JEAN BAPTISTE, fils, of Aix, Provence. *A new system of anchor.* Patent dated July 13, 1854. (No. 1543.)

The inventor describes an anchor, which he calls the "Tutela anchor," in which the arms are so swivelled that they move in a plane at right angles to that in which the ordinary arms move, both flukes taking and holding into the ground at the same time.

MARYON, ROBERT JAMES, gentleman, of York-road, Lambeth, Surrey. *Improvements in the construction of, and arrangement of, and application of steam engines for the better means of transmitting motion, and of applying steam or other motive power.* Patent dated July 13, 1854. (No. 1544.)

This invention comprises a variety of arrangements of steam engines, and the parts of engines, which we shall probably describe at the necessary length hereafter.

STOCKER, ALEXANDER SOUTHWOOD, of Poultry, London, manufacturer. *Improvements in axles.* Patent dated July 14, 1854. (No. 1545.)

Claims.—1. The making of axles in which one tube is shrunk on to or formed or drawn over another. 2. The combination of a tube or tubes with a trilateral, cruciform, or other similar sectioned core. 3. "The making of axles with a series of tubes, as described, whether the tubes be made in the ordinary methods at present in use for making tubes, or by any other plan; as also whether they are first manufactured and shrunk on or otherwise applied, or are formed on or upon the core or journals." 4. Galvanizing tubular axles.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MORISON, ANDREW, of Inchmichael, Perth, Scotland, farmer. *An improved mode of protecting or preserving agricultural and horticultural produce from disease or blight.* Application dated July 7, 1854. (No. 1494.)

This invention consists in placing metal bars, rods, or wires in the ground for attracting the electricity of the atmosphere and carrying it into the earth, and thereby preventing the ordinary effects produced by it upon plants and crops exposed to its influence.

ROSS, JESSE, of Keighley, York, gentleman. *Improvements in making compounds of chocolate, cocoa, and other ingredients for breakfast and occasional beverages.* Application dated July 7, 1854. (No. 1496.)

The inventor says that in carrying out his invention, coffee, chicory, chocolate, and cocoa "may be used in various proportions and combinations."

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved construction of pump for raising and forcing fluids.* (A communication.) Application dated July 7, 1854. (No. 1497.)

The barrel of this improved pump is fitted with two valve pistons, the rod of the lower one of which passes through the centre of the upper piston, and each of the two rods carries a rack at its upper end. These racks are set back to back and slide in a fixed guide secured to the pump cylin-

der. Between the racks passes a rocking axle, which has its bearings on the top of the cylinder, and carries a cog-wheel for transmitting motion to the valve pistons. This cog-wheel gears into a pair of segment racks, which are attached to other segment racks in gear with the racks on the valve rods. When, therefore, by means of a handspike, or otherwise, the rocking axle is set in motion, the cog-wheel which it carries will, through the segment racks and the straight racks on the rods, cause the simultaneous advance or recession of the two valve pistons to or from each other, and thereby produce a continuous lifting action.

LORD, EDWARD, of Todmorden, York, machinist. *Improvements in machinery for cleaning and carding cotton and other fibrous materials.* Application dated July 8, 1854. (No. 1508.)

These improvements consist in applying under the beaters, toothed cylinders, or wire cylinders, of blowers and other similar machines of the like nature, a plate covered with wire cards, or having teeth upon it, such cards or teeth being set at an angle, so that the fibrous material under operation will strip them off, &c.

BECK, DAVID, of Carlton-house, Southampton, doctor of medicine. *Improvements in brewing and distilling.* Application dated July 10, 1854. (No. 1509.)

This invention consists in converting the whole quantity of starch contained in or extracted from malt or grain, into saccharine matter. "This I effect," says the inventor, "by means of acids, but particularly by the sulphuric acid; after a sufficient decoction, I separate the acid from the said saccharine matter, by chalk or any other absorbent or alkaline substance or liquid. The saccharine matter is then fermented, in the ordinary way, for the purposes of brewing or distilling."

SWINDELLS, ISRAEL, of Manchester, Lancaster, manufacturing chemist. *Improvements in the treatment of wood and vegetable matters, for the production of vegetable fibre.* Application dated July 10, 1854. (No. 1511.)

The object of this invention is to reduce waste cuttings of timber and loppings of trees to a kind of vegetable wool. "I take any of the alkalis," says the inventor, "and digest the wood or vegetable matters. I take any convenient vessel; for wood I take one pound of any caustic alkali or any caustic earth, to one gallon of water, and steep for any length of time, until I produce the desired effect."

MOORE, CHARLES FREDERICK, of Portswood-park, Southampton, Hampshire, gentleman. *Improvements in the construction and use of an apparatus, closet, or receptacle, to be used instead of a water-closet or other necessary, and which may be either fixed or portable.* Application dated July 11, 1854. (No. 1518.)

The inventor so arranges his apparatus, that on a board or step being pressed by the foot or other part of the person coming in contact with the box, it will act on a lever and spring, which will open a trap, screen, or valve, which closes when the pressure is removed. He proposes to deodorize the soil within the apparatus.

GATTY, FREDERICK ALBERT, of Accrington, Lancaster, manufacturing chemist. *An improvement in the manufacture of printed receipt-stamps.* Application dated July 12, 1854. (No. 1522.)

This improvement consists in applying such colours to the printing of receipt-stamps as will change or become effaced when treated with acids, or other chemical agents. The colours applied are lead, orange, ultramarine, blue, or some others of the same kind mixed with glue or gummy substances, without any varnish or oily substance.

TOWNSEND, MATTHEW, of Leicester, manufacturer. *Improvements in the manufacture of knitted fabrics.* Application dated July 12, 1854. (No. 1523.)

These improvements consist in forming the legs or ankles and part of the feet of "circular" or "round" knitted fabric, and in applying "fashioned" portions to form the heels and toes.

MOORE, THOMAS EDWIN, of St. Marylebone, Middlesex, engineer. *Improvements in apparatus to be used for extinguishing fires.* Application dated July 12, 1854. (No. 1527.)

This apparatus is composed of a vessel formed of plate iron, circular at the top, flat at the sides and end, and rounded at the bottom. At each side is a tank for supplying the interior of the vessel with water, and at the front end is a mouth-piece with a sliding door.

ARMSTRONG, ROBERT, of Hall-street, City-road, Middlesex, consulting engineer, and JAMES BERNERD DEW, of Pentonville, Middlesex, gentleman. *An improved apparatus for consuming smoke.* Application dated July 12, 1854. (No. 1528.)

The inventor proposes to feed the furnace through a certain passage with air heated by passing between the firebars and a fixed plate.

LOISEAU, ALPHONSE JULIEN, machinist, of Paris, France. *Certain improvements in manufacturing fringes and other plaited fabrics.* Application dated July 12, 1854. (No. 1529.)

The inventor employs a braiding machine constructed with bobbins, carried

round by revolving discs or heads, so as to plat or interlace the threads, &c., &c.

MARSHALL, JOSIAH THOMPSON, of New York, United States of America, gentleman. *Improvements in reefing and furling the sails of ships or other vessels.* Application dated July 12, 1854. (No. 1530.)

The inventor proposes to furl sails from their lower parts, &c.

ROBERTSON, JAMES, of Kentish-town, Middlesex, cooper. *Improvements in the consumption or prevention of smoke.* Application dated July 12, 1854. (No. 1532.)

The inventor describes a furnace in which "the bridge is made to overhang the bars considerably in the direction of the furnace door, and immediately in front of the overhanging portion of the bridge is fitted a moveable inclined grating, or series of bars, which oscillate upon a fixed centre at the back of the stationary furnace bars."

PROVISIONAL PROTECTIONS.

Dated October 14, 1854.

2202. Louisa Monzani, of Greyhound-place, Old Kent-road, Surrey, widow and administratrix of Willoughby Theobald Monzani, late of St. James's-terrace, Bermondsey, Surrey, gentleman, deceased. Improvements in bedsteads, and packing-cases or boxes to contain the same and other articles.

Dated November 14, 1854.

2414. George Bodley, of Everard-street East, London. Improvements in revolving cannon.

Dated December 19, 1854.

2671. William Porter Dreaper, of Bold-street, Liverpool, Lancaster, pianoforte manufacturer. The improvement of the manufacture of pianofortes.

Dated January 1, 1855.

3. Joseph Seguin, of Paris, France, civil engineer. Improvements in obtaining motive power by the expansion of air, steam, and other fluids.

5. Stephen Giles, of Caledonian-road, Islington, Middlesex, engineer. An improved ratchet brace.

Dated January 2, 1855.

7. Antoine Roullion, gentleman, of Paris, French Empire. Certain improvements in the manufacture of soap.

9. Joseph Arnold, of Tamworth, Stafford. A new mode of ornamenting bricks, and other moulded articles for building purposes.

11. George Peacock, of Gracechurch-street, London, ship owner. Improvements in constructing propellers for ships and other vessels.

Dated January 3, 1855.

13. Félix Gabriel Céleatin Dehaynin, of Paris, France. Improvements in the purification of hydrogen gas.

15. Isaie Lippmann, of Rue Geoffroy St. Hilaire, Paris, France, tanner. An improved machine for splitting or sawing the skins of calves, oxen, cows, horses, and other animals.

17. Samuel Aspinwall Goddard, of Birmingham, Warwick, merchant and manufacturer. A new or improved fire-arm, a portion of which is applicable to ordnance.

19. Jacob Gaskell, of Manchester, button manufacturer, and George Holcroft, of the same place, consulting engineer. Improvements in the manufacture of mortar and cement.

21. Alexander Southwood Stocker and Samuel Darling, of the Poultry, Cheapside, London, manufacturers. Certain improvements in the manufacture of bottles, pots, jars, tubes, and other receptacles, part of which improvements are applicable to various other purposes for commercial and domestic use.

23. John Venables and Arthur Mann, of Burslem, Stafford, earthenware manufacturers. Improvements in producing figures or ornaments in articles made of clay or plastic material.

25. George Walker Muir, of Glasgow, Lanark, Scotland. Improvements in warming and ventilating.

Dated January 5, 1855.

27. Louis Jacques Martin, of Paris, France, engineer. Improvements in the composition of colours for printing and dyeing, and in the application of such colours.

29. William Henry Bulmer, of Queen's Head, near Halifax, machine maker, and William Bailey, of Halifax, engineer, both in York. Improvements in machinery or apparatus for combing wool, cotton, and other fibrous substances.

31. Robert Ashworth, of Rochdale, Lancaster, engineer, and Samuel Stott, of Rochdale, Lancaster, cotton spinner. Improvements in machinery for preparing, spinning, and doubling fibrous substances.

33. Frederic Prince, of South-parade, Chelsea, Middlesex. Improvements in cartridges for firearms.

Dated January 6, 1855.

35. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for effecting agricultural operations, parts of the said improvements being applicable for the obtainment of motive power for general purposes. A communication.

37. Jean Baptiste Edouard Rüttre, of Paris, France, manufacturer. Improvements in the treatment of rags and other goods, formed partly of wool and partly of vegetable fibres, in order to separate the vegetable fibres from them and obtain the wool in its pure state.

39. John Scott, of Sunderland, Durham, blacksmith. Improvements in the construction of anchors.

41. Charles John Edwards, junior, of Great Sutton-street, Clerkenwell, Middlesex, mill-band manufacturer, and Frederick Frasi, of Tavistock-terrace, Holloway, engineer. An improved manufacture of bearings for carriage axles and shafts of machinery in general.

Dated January 8, 1855.

43. John Huggins, of Birmingham, Warwick, machinist. A new or improved machine for the manufacture of lint.

45. Robert McCall, of Pallas-Kenry, Limerick, Ireland. Certain improvements in the manufacture of iron and steel.

47. William Hay and James Hay, of Glasgow, Lanark, North Britain, engineers. Improvements in engines for obtaining motive power.

49. Isaac Bury, of Manchester, Lancaster, embosser and finisher. A certain improvement in embossing Orleans cloth, or other similar fabrics, commonly called stuff goods.

Dated January 9, 1855.

51. Edward Hayes, of Stony Stratford, Bucks. Improvements in apparatus for feeding thrashing machines.

53. Joseph Offord, of Wells-street, Oxford-street, Middlesex, coach builder. Improvements in the construction of carriages.

55. Pierre Emile Thomas, of Paris, France, chemical engineer. Improvements in the treatment of tissues and other goods formed of wool, mixed with other textile fibres, in order to obtain the wool from them.

57. Henry John Hall, of Charlton, Kent, commander in the Royal Navy, and Alexander Dalgety and Edward Ledger, both of Deptford, Kent, engineers. Improvements in apparatus for propelling, guiding, or manœuvring ships or boats.

59. William Major, of Copenhagen, Denmark, engineer. Improvements in the construction and arrangement of screw propellers.

Dated January 10, 1855.

61. Thomas Wilson, of Birmingham, Warwick, engineer. An inprovement or improvements in the manufacture of bands used in the construction of small arms.

62. Bartholomew Predaval, of Great Russell-street, Bedford-square, Middlesex, civil engineer. Improving the production and manufacture of pulp for the making of paper.

63. William Thomas Henley, of Saint John-street-road, London, electric telegraph engineer and machinist. Improvements in steam boilers or generators, and in apparatus in connection therewith.

64. Edward Booth, of Gorton, Lancaster, gum manufacturer. Certain improvements in the mode and machinery for dressing, starching, and finishing textile and other fabrics and materials.

65. William Coles Fuller, of Bucklersbury, Cheapside, London, India rubber spring manufacturer. Improvements in the construction and adaptation of India rubber springs.

66. Henry Bessemer, of Queen-street-place, New Cannon-street, Middlesex, engineer. Improvements in the manufacture of iron and steel.

68. Louis Pierre Lehugeur, mechanic, and Michel Uttinger, gentleman, of St. Denis, near Paris. Improvements applicable to machinery for printing fabrics.

Dated January 11, 1855.

69. John Gedge, of Wellington-street South, Middlesex. Improvements in the construction of metallic flooring, supports for floors, walls, or partitions of buildings. A communication from M. Nicolas Gervis, of Paris, France.

70. Jacques Louis Hervé, of Paris, France, Rue de l'Eperon, householder. Improvements in preserving meat and fish.

71. John Norton, of Dublin, Ireland, esquire. Improvements in draining land.

72. Alexander Robertson, of Upper Holloway, Middlesex, engineer. A new manufacture of packages for dry goods.

73. Edward Hall, of Dartford, Kent, engineer. Improvements in the manufacture of gunpowder.

74. Robert Oxland, of Plymouth, Devon, sugar refiner. Improvements in the manufacture and revivification of animal charcoal.

75. Elmer Townsend, of Massachusetts, United States of America. New and useful improvements in machinery for sewing cloth, leather, or other material. A communication from Alfred Swingle, of the said State.

76. James Wood, of Barbican, London, printer. An improved process for lettering and ornamenting glass, which the inventor terms hyalotypy.

77. William Lynall Thomas, of Anderton, Devon, gentleman. Improvements in projectiles and gun wads.

78. Smith William Davids, of Carnarvon, North Wales, slate agent. Certain improvements in elongating chandeliers and gaseliers.

Dated January 12, 1855.

81. William Hunt, of Tipton, Stafford, chemist. Improvements in the manufacture of iron.

82. Joseph Ray Hodgson, of Sunderland, carver and gilder. Improvements in the construction of anchors.

83. François Victor Guyard, engineer, of Gravelines, French Empire. Certain improvements in the electro-telegraphic communications.

84. Ezra Miles, of Stoke Hammond, Bucks, civil engineer. An improved coupling joint or connection for tubing or other purposes.

85. Christopher Turner, of Burnley, Lancaster, weaver. Certain improvements in power looms for weaving.

86. Joseph Harrison and John Oddie, of Blackburn, Lancaster, machinists. Improvements in machines for sizeing, drying, and otherwise preparing yarns or threads for weaving.

87. Francis Preston, of Manchester, machinist. Improvements in ordnance and in projectiles for ordnance and small arms.

88. William Barningham, of Salford, Lancaster, iron manufacturer. Improvements in connecting the rails of railways.

89. Anton Seithen, of Coblenz, Prussia, cork manufacturer, and Joseph H. Lichtenstein, of Berlin, Prussia. Improvements in machinery or apparatus for cutting and shaping cork.

90. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Certain means of devulcanizing India rubber and other similar gums, or of treating such gums after having been vulcanized. A communication.

91. Peter Nicholas Gadol, of Bermondsey, Surrey, tanner. An improved process to be employed in tanning.

Dated January 13, 1855.

93. William Henry Nevill, of Llanelly, Carmarthen, copper smelter. Improvements in the construction of reverberatory furnaces for the collection and condensation of volatile substances.

94. John Graham, of Hartshead Print-works, near Stalybridge, Lancaster, calico printer. Improvements in fixing certain colours in or upon yarns and textile fabrics.

95. Gustav Warnecke, of Frankfort-on-the-Maine, merchant. Improvements in preserving vegetables and fruits.

96. Joseph Claudot, of Paris, France, architect. An improved stucco.

97. Michael Daintry Hollins, of Stoke-upon-Trent, Stafford, gentleman. Improvements in slip kilns for drying clay.

98. Edward Lambert Hayward, of Blackfriars-road, Surrey, manufacturing ironmonger. Improvements in kitchen ranges.

99. John Charles Pearce, of the Bowling Iron-works, York, engineer. Improvements in machinery or apparatus for the manufacture and working of iron and other metals.

100. Joseph Edlyn Outridge, of Constantinople, now at Blackfriars-road, Middlesex. Improvements in transmitting motive power.

101. John Greenwood, of Irwell-springs, near Bacup, Lancaster, Turkey-red dyer. Certain improvements in sizeing, stiffening, and finishing textile fabrics or materials.

Dated January 15, 1855.

102. Francis Burke, gentleman, of Woodlands, Montserrat, British West Indies. Improvements in and apparatus for obtaining from the plantain, banana, aloe, penguin, and other vegetable substances, fibres, applicable to various manufacturing purposes.

103. William Toplis Frost, of Shottle, near Belper, Derby, gentleman. Improvements in machinery for cleaning knives.

104. Henry Mortlock Ommanney, of Chester, esquire. An improvement in the manufacture of shot, shells, hollow shot, and other projectiles.

105. James Peter Lark, of Nine Elms-lane, Vauxhall, Surrey, foreman to Messrs. Francis, Brothers, cement manufacturers. Improvements

in effecting the combustion of fuel and the consumption of smoke in steam boiler and other furnaces.

106. George Riley, of Portland-place North, Clapham-road, Surrey. An improved false bottom for brewers', distillers', and vinegar makers' mash tubs.

107. Edward Haynes, jun., of Bromley, Middlesex, engineer. A smoke-consuming furnace.

Dated January 16, 1855.

108. Marc Toussaint Stefani, of Paris, France, gentleman. Improvements in fire-arms.

110. Henry Adkins, of Edgbaston, near Birmingham, Warwick, manufacturer. An improvement or improvements in bleaching or decolorizing oily and fatty bodies.

111. James Yeoman, of Walworth, Surrey, millwright and engineer. Improvements in self-feeding furnaces.

112. George Jackson, of Manchester, Lancaster, decorator. Certain improvements in the construction of tents.

113. James Simkin, of Bolton-le-Moors, Lancaster, gun maker. Improvements in rifles and other fire arms.

114. James Lee Norton, of Holland-street, Blackfriars, Surrey. Improvements in recovering the wool from fabrics composed of wool, or wool in connection with cotton or other vegetable substance.

115. Jonathan Saunders, of St. John's-wood, Middlesex. An improvement in the manufacture of axles and shafting.

117. Robert James Maryon, gentleman, of York-road, Lambeth, Surrey. Improvements in the construction of steam engines, which consists of a better means of mechanism for effecting the transmission of, and conversion of action of motion for working and applying steam or other equivalent motive power.

Dated January 17, 1855.

118. George William Garrood, of Burnham, Essex. An improved apparatus to be used in conjunction with windlasses on ships, cranes on land, and with other machinery for raising or lowering weights for the purpose of guiding and controlling the action thereof.

119. Samuel Lomas, of Manchester, machinist. Improvements in machinery for winding and doubling silk.

120. Joshua Horton, of Birmingham, Warwick, manufacturer. An improvement or improvements in packing or storing gunpowder.

121. Ambroise Quertinier, of Charleroi, Belgium, merchant. An improvement in glass furnaces.

122. Alexander Colles, of Millmount, Kilkenny, Ireland, marble manufacturer. Improvements in sawing marble and similar materials. A communication.

123. David Davidson, of Meiklewood, by Stirling, North Britain, captain in the Hon. East India Co.'s service. Improved apparatus for pointing ordnance, and restoring the aim of the piece, either by day or night, when it is once obtained.

124. James Webster, of Collingham, York, corn miller. Improvements in the application of motive power.

125. James Higgins, of Salford, Lancaster, machine-maker, and Thomas Schofield Whitworth, of the same place, mechanic. Improvements in moulding for casting shot, shells, and other articles.

127. Edward Hall, of Salford, Lancaster, gentleman. Improvements in combining metallic wires with textile materials, or fabrics for forming wire ribbon.

128. Lamorock Flower, of Great Russell-street, Bloomsbury, Middlesex, and George Augustus Dixon, of Cobham Hall, Stratford, Essex. Improvements in machinery or apparatus for sifting and cleansing.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

154. Charles Van den Bergh, of Lacken, by Brussels. Improvements in rotatory steam engines. January 20, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," January 30th,* 1855.)

2022. Joseph Porter. Improvements in machinery for cutting, punching, forging, and forming nuts, bolts, screws, and various other articles in metal.

2023. James Kershaw. Improvements in looms for weaving.

2032. Auguste Edouard Loradoux Bellford. Certain improvements in machines for drilling stone. A communication.

2046. Thomas Lawrence. Improvements in machinery or apparatus to be employed for the purpose of shaping and finishing certain parts of bayonets.

2047. Peter Spence. Improvements in obtaining sulphur from iron pyrites and other substances containing sulphur.

2048. George Collier and Samuel Thornton. Improvements in looms for weaving.

2055. Robert Pinkney. Improvements in stoppers, corks, or valvular apparatus for bottles or receptacles for liquids, and in the machinery or apparatus employed for making the same.

2061. Philip James Chabot. Improvements in supplying air to furnaces.

2065. Joshua Bacheler Halsey. An improved machine or apparatus for crushing and pulverising ores, and for separating the gold therefrom by amalgamation.

2068. George Spencer. Improvements in the external coverings of roofs and walls of buildings and sheds, and in the windows of such buildings and sheds.

2072. Thomas Griffiths. An improved pump for raising and forcing water.

2079. Robert Renfrew. Improvements in bobbins

2092. Thomas Foxall Griffiths. An improvement or improvements in lamps.

2108. Williams Wood Cook. An improved method of weaving or manufacturing woven fabrics, suitable for petticoating or similar purposes, where thick and thin parts of the same fabric are required.

2115. Christopher Hill. Improvements in the manufacture of pulp.

2125. Wright Townend. An improvement in combing wool and other fibres.

2139. Thomas Edwin Moore. Certain improvements in machinery or apparatus for curvilinear and annular cuttings in metals and other hard substances.

2171. William Chubb. Improvements in the construction of beams and parts of ships, ships' masts and spars, and other like structures.

2202. Louisa Monzani. Improvements in bedsteads and packing-cases or boxes to contain the same and other articles.

2224. Richard Green. Improvements in propelling vessels.

2452. Richard Keefe. Improvements in dressing flour.

2455. Nicholas Callan. Improvements in exciting agents used in galvanic batteries, and in the construction of galvanic batteries.

2573. John Collis Browne. An improved wrapper applicable as a coat and other covering.

2610. Christian Henry Richard Ebert and Lippman Jacob Levisohn. Improvements in the mode

of rendering certain cases or receptacles extensible.

2645. Robert Adams. Improvements in fire-arms called revolvers.

2660. Charles Frederick Stansbury. An improved life-car or buoy. A communication from F. Z. Tucker, of Brooklyn, New York, United States of America.

2724. Frederick Samson Thomas and William Evans Tilly. An improved process for plating or coating lead, iron, or other metals with tin, nickel, or alumina.

2729. John Lang Dunn. Improvements in working up certain waste sulphates and nitrates, and for the manufacture of useful products therefrom.

2751. Thomas Thorneycroft. Improvements in ship-building.

9. Joseph Arnold. A new mode of ornamenting bricks and other moulded articles for building purposes.

15. Isaie Lippman. An improved machine for splitting or sawing the skins of calves, oxen, cows, horses, and other animals.

22. John Venables and Arthur Mann. Improvements in producing raised figures or ornaments upon the surfaces of articles made of metal, pottery, and earthenware, glass, papier maché, and other materials.

23. John Venables and Arthur Mann. Improvements in producing figures or ornaments in articles made of clay or plastic material.

27. Louis Jacques Martin. Improvements in the composition of colours for printing and dyeing, and in the application of such colours.

29. William Henry Bulmer and William Bailey. Improvements in machinery or apparatus for combing wool, cotton, and other fibrous substances.

32. John Livesey. Improvements in printing, and in the materials and apparatus connected therewith. A communication.

35. John Henry Johnson. Improvements in machinery or apparatus for effecting agricultural operations, parts of the said improvements being applicable for the obtainment of motive power for general purposes. A communication.

39. John Scott. Improvements in the construction of anchors.

55. Pierre Emile Thomas. Improvements in the treatment of tissues and other goods formed of wool, mixed with other textile fibres, in order to obtain the wool from them.

71. John Norton. Improvements in draining land.

75. Elmer Townsend. New and useful improvements in machinery for sewing cloth, leather, or other material. A communication from Alfred Swingle, of Massachusetts.

82. Joseph Ray Hodgson. Improvements in the construction of anchors.

89. Anton Seithen and Joseph H. Lichtenstein. Improvements in machinery or apparatus for cutting and shaping cork.

99. John Charles Pearce. Improvements in machinery or apparatus for the manufacture and working of iron and other metals.

112. George Jackson. Certain improvements in the construction of tents.

154. Charles Van den Bergh. Improvements in rotatory steam engines.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

NOTICE OF APPLICATION FOR LEAVE TO FILE DISCLAIMER.

An application will be made to Her Majesty's Attorney-General by Joseph Lamb, of Manchester, Lancaster, spindle-maker, for leave to file a disclaimer and memorandum of alteration of parts of the specification of the patent granted to him for "A certain improvement or improvements in machinery for preparing and spinning cotton, wool, flax, silk, and similar fibrous materials." December 8, 1843.

WEEKLY LIST OF PATENTS.

Sealed January 26, 1855.

1659. Henry Wickens.
1665. Richard Johnson.
1679. Auguste Edouard Loradoux Bellford.
1689. Edward Gillman.
1724. Edward Alexandre.
1738. Antoine Corvi.
1761. Thomas George Taylor.
1768. Henri Louis Edmond Désiré Hennebutte.
1777. John Norton.
1785. Samuel Frankham.
1788. William Burgess.
1789. William Siddons.
1796. John Turner Wright and Edwin Payton Wright.
1798. Charles Blake.
1868. Henry Bessemer.
1882. John Kirkham and Thomas Nesham Kirkham.
1956. James Burns.
2169. John Kershaw.
2196. Anthony Bernhard Baron Von Rathen.
2311. William Reid.
2416. David Davies.
2458. Fisk Russell.
2459. William Beasley.
2481. Samuel Alfred Carpenter.
2486. Cyprien Marie Tessié du Motay.
2489. Henry Bessemer.
2490. Thomas De la Rue.
2496. Joseph Gillott, the younger, and Henry Gillott.
2510. George Gowland.
2512. Sydney Smith.
2518. Edwin Pettitt.
2521. John Sands.
2542. Joseph Maudslay.

Sealed January 30, 1855.

1713. Alfred Kortright.
1745. William Armand Gilbee.
1793. William Johnson.
1795. Charles Cowper.
1815. Frederick Crace Calvert.
1879. Thomas Carr.
2539. Auguste Edouard Loradoux Bellford.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

A Workman, Shrewsbury.—We think the statement you allude to is perfectly erroneous, and very much doubt if you will obtain any other satisfactory explanation of it.

Watt.—We have not Nicholson's work at hand, and cannot therefore give the verification you require.

J. Ward.—We cannot do better than submit to you the following remarks upon the subject you mention. They occur in a paper read last week before the *Society of Arts* by Mr. Longmaid:—"A most perfect trial has been made in the dissecting rooms of St. Bartholomew's Hospital, which must abound in noxious gases and putrescent odours. On thoroughly heating the charcoal and placing it in shallow vessels about the rooms, it acted so promptly, that in ten minutes not the least diffused smell could be detected. So quick and effectual was its action, that arrangements have been made for its constant use. As a purifier of hospital wards, both civil and military, it might be applied with great advantage, saving patients from the unpleasant smells and effluvia from gangrenous wounds; thus the patient himself, and those in adjacent beds, would not be subjected to the influence of putrescent odours. All these the charcoal would effectually absorb. Charcoal is more efficacious than any other disinfectant when applied in the manner described, absorbing gases of every kind. It does not require the presence of any other substance to assist its action, but without stint or scruple collects noxious vapours from every source, not disguising, but condensing and oxidising the most offensive gases and poisonous effluvia, converting them into simple, inert, staple compounds. It is easy of application, and is economical, comes within the reach of the poorest, and can be safely placed in the hands of the most ignorant, thus combining advantages not possessed by any other disinfectant."

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co. Dublin; W. C. Campbell and Co., Hamburg.

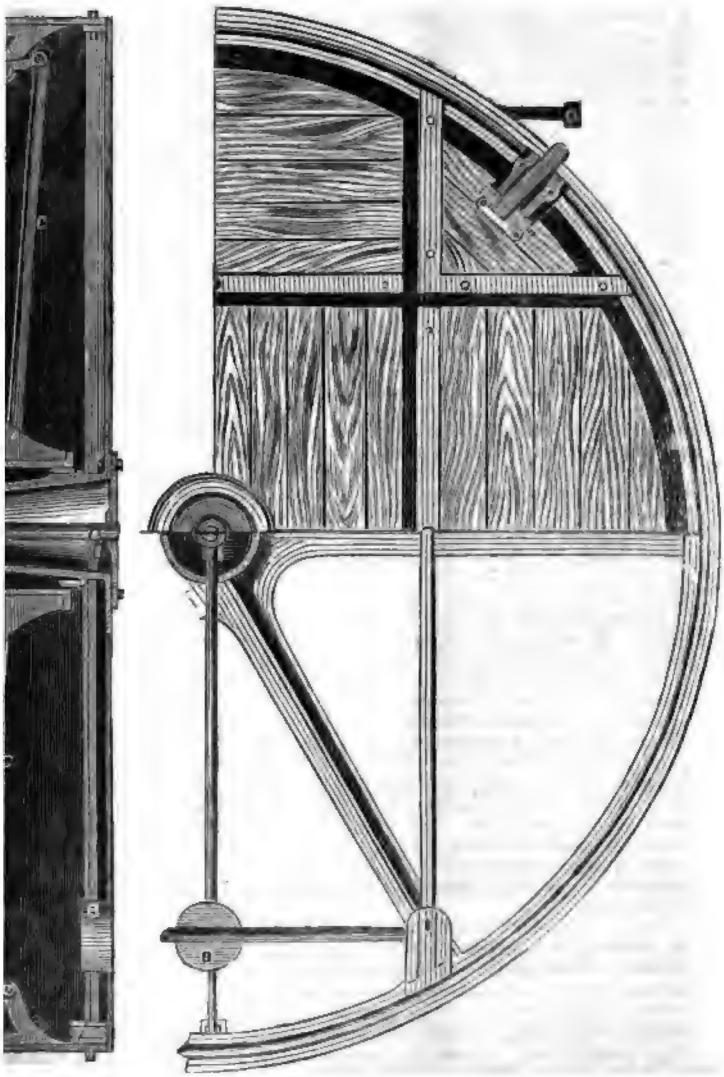
Mechanics' Magazine.

] SATURDAY, FEBRUARY 10, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

LLOYD'S PATENT TURNTABLE.

1. Fig. 2.



LLOYD'S PATENT TURNTABLE.

Patent dated October 21, 1853.)

Mr. Samuel Lloyd, Jun., of Wednesbury, has patented an invention the object of which is to produce a more durable Turntable than those ordinarily in use, by constructing it so that the working parts of the table, viz., the rollers and centre, may be preserved from injury when engines and carriages run over it.

The considerations which have led Mr. Lloyd to effect and introduce his improvements will be found in the following extracts from a paper recently prepared by him, and read before the Institution of Mechanical Engineers.

"In the construction of turn-tables three leading principles have been followed: either the bearing has been on the centre only, with no bearings at the circumference, or with bearings at the circumference and none at the centre; or a combination of these two modes has been adopted by allowing the weight to rest in part upon the centre, and in part upon the bearings or rollers at the circumference; this last construction has been most frequently adopted. Most of the turn-tables first laid down on railways were made to rest on fixed rollers, for the sake of economy; but although fixed roller turn-tables are the cheapest kind in first cost and were much used on the first railways made, live roller-tables have been generally adopted latterly, from the greater ease with which they turn; as in the fixed roller turn-table the weight bears on the axle of the roller, producing rubbing friction, but in the live roller table it bears upon the circumference of the roller, producing only a rolling action without any rubbing friction, except in the guiding ring. Some fixed roller turn-tables have, however, of late been constructed with much larger rollers than those formerly used, which has the effect of perceptibly lessening the friction; but these tables seldom continue long in good working order, in consequence of the rollers *indenting* the top table. This is an objection to which all roller turn-tables are subject, but those with fixed rollers most especially, from the top-table always resting upon the rollers in these, in the same position, thus receiving the pressure always on the same points; and as the amount of surface in contact between them is very small, the whole amount of surface in contact between the surface of the rollers and the top table being not more than three square inches, if so much, the rollers soon wound the under surface of the top table, so that the latter becomes indented over every roller. As soon as this takes place, considerably more power has to be exerted to turn carriages upon them, as the resistance to be overcome is greatly increased by the whole weight having to be lifted out of each of the hollows formed from the above cause.

"But in addition to the increase of friction occasioned by these indentations, they cause also great unsteadiness, making the table rock, and thus clatter and hammer against the rollers as each pair of wheels passes on and off its two opposite sides. This deteriorating action goes on to a greater or less extent in almost all roller tables, often occasioning the top to break, if it is not very strongly made; this rocking is often greatly increased, and occasionally entirely originates, from the centre pin being too tightly screwed down, so as to take the weight entirely off the rollers on one side of the table.

"This defect has led to the construction of turn-tables with a centre pin, that acts merely as a centre guide, without taking any weight. Turn-tables of this class, if made with radiating rollers, have the advantage of remaining very solid for a time after they are put in; but frequently this is not of long continuance, for all roller turn-tables are unsteady, if the rollers are not *all* correctly turned to the same diameter, and cottered or screwed up exactly to the same distance from the centre; each roller being a portion of a cone, its outside diameter is greater than its inside, and if either of the rollers is screwed up too tightly, the table rides on it. This is sometimes occasioned after a few months' wear, by the pressure of the table top continually exerting a force tending to drive the rollers upon which it rests outwards, which is sure to be the effect if either of the nuts that screw them up becomes slack. This pressure tending to force the rollers off the roller-path causes considerable friction against the guide-ring at the boss of every roller, and is one cause of the heaviness with which even live-roller turn-tables work, causing railway labourers in goods stations, whenever they have the chance, to wrench them round by horse-power.

"In an improved construction of roller turn-tables extensively adopted, the weight of the table top is nearly counterbalanced by a weighted lever, which constantly tends to lift the centre pin without actually doing so, making the table much easier to turn, by diminishing proportionately the pressure on the rollers; the rollers also are not fixed as in common turn-tables, but in an inclined position, with their upper surfaces level, for the purpose of preventing the level of the table top from being disturbed by the surge of carriages passing over. In some turn-tables the rollers have been made with rounded edges,

and level roller-paths, with the view of lessening the friction of turning, and increasing the steadiness of the table by resting it on a plane instead of a cone; but these rollers have not been found to be durable, and the roller-path becomes worn hollow by them. A more successful plan for diminishing the friction has been the use of spherical balls instead of rollers, travelling round in a live ring, to prevent the balls from rolling off, but allowing them room to shift their position on the roller-path as they move round, which prevents them from wearing the roller-path into grooves; and as the balls travel in a circle, sometimes in one direction and sometimes in the contrary direction, they continually present a fresh portion of their surface for the bearing, which preserves them from being worn unequally.

"There is one objection to these tables, but which applies still more strongly to roller turn-tables, namely, the extreme difficulty of turning them in frosty weather, when the dirt on the rollers and roller-paths becomes frozen; horse-power is then often required to stir them, or a fire has to be lighted to thaw the congealed mud collected on them.

"*Centre-bearing turn-tables* are practically free from this objection, and also from the one before referred to, namely, the bearing surface becoming indented, from the small extent of surface in contact with the rollers. This description of turn-table has two important advantages:—Great *ease in turning* and smoothness of motion, and great *durability*, numbers of them having continued in use for many years without requiring any repairs.

"Centre-bearing turn-tables, as usually constructed, have most of them two defects; namely, great extra cost of foundations, and unsteadiness and liability to deflect; the last being the most serious defect, which renders them objectionable for any situation where much traffic is likely to pass over them. Their deflection upon trains passing over them being caused by the whole of the weight of each carri ge acting at a great leverage to strain the working parts of the table while running on and off. To meet this defect, a number of supplementary rollers have usually been fixed at the circumference, for the purpose of catching the weight, and preventing any undue deflection when the weight is passing on and off the edge of the table, these rollers being fixed a little below the level of the table top, so as not to touch the top and come into action until the top gives way by deflection, or by canting on one side. This plan has, however, the objection of being unmechanical, as it implies a certain degree of failure in the machine before it can come into full operation."

To do away with this straining action, which is produced when the weight of the carriage is received by the outer part of the table, Mr. Lloyd adds four sliding blocks and a balance weight to the form of table known as Handcock's patent. The engravings on the first page of this Number represent the improved table, fig. 1 being a sectional elevation, and fig. 2 a plan. A A are the sliding-blocks, which are arranged around the circumference of the table, and worked by a lever, C. B is the balance weight, which is equal in weight to the top of the table within about 28 lbs., so that the lever, C, and the blocks, A A, may be worked with ease. It will be observed, that when the blocks are brought in beneath the table, the latter is thereby raised about a quarter of an inch. This is the position in which it remains when out of use, and it therefore presents a perfectly solid surface for trains to pass over, and the disagreeable clatter so generally noticeable on the passing of trains over the turn-tables at the railway stations is altogether avoided. The merits of this arrangement are so obvious, that we need not add our commendations to the foregoing description.

LONDON FIRES IN 1854.*

Twenty-fourth Annual Report. By Mr. William Baddeley, C. E., Inventor of the Portable Canvas Cisterns, Improved Jet-spreaders, Farmers' Fire-engine, &c.

"The statistics of London Fires are by no means devoid of interest, and the time may come when they will form an index to the social advancement of the people; for, in proportion as houses are built more and more fire-proof, and habits of carefulness become more and more diffused, the number of destructive fires will assuredly lessen."—*Knight's London.*

SCARCELY any subject of domestic information had been so generally neglected, up to the commencement of the publication of these "annual reports," as the statistics of fire.

* Since this paper was in the printer's hands, a very interesting article, headed, "*Twenty Thousand Fires*," founded upon Mr. Baddeley's Annual Reports, has appeared in No. 57 of *Chambers's Journal*.—ED. M. M.

Although the *Hand-in-Hand*, and several other Insurance offices sprung into existence at the close of the 17th, and the beginning of the 18th centuries, each office collected and kept to itself the statistics of its own solitary experience.

On the formation of the *London Fire-engine Establishment*, a more perfect means was afforded for collecting and recording, in a systematic manner, the statistics of London fires; and the published results show the vast amount of useful and interesting information necessarily embodied in these records. A striking illustration of this is afforded by the publication in the last number of the *Quarterly Review* of an article upon "Fires and Fire-insurance," in which the records of the past are worked up into one of the most able and interesting papers ever published on the subject.

To these records I have now the pleasure of adding those of another year, the consequences of which have been peculiarly unfavourable to the Insurance offices; especially in the provinces. London exhibits an increase in the number of its serious fires, as well as in the total number reported.

The number of London fires in 1854, was 953; being an increase of 53 upon the previous year. The *totally destroyed* also shows an increase of 12, and the *seriously damaged* an increase of 66, in the same period. Of these fires, 253 were extinguished by the unaided efforts of the inmates of the premises; 340 were extinguished by the inmates with casual assistance; while the extinction of 360 devolved upon the firemen.

Parish engine-keepers have rendered useful and efficient aid on upwards of 55 occasions.

The following TABLE shows the Monthly Distribution of last Year's Fires:

Months.	Number of Fires.	Fatal Fires.	Lives Lost.	Chimneys on Fire.	False Alarms.
January	93	1	1	9	8
February	88	5	12	12	1
March	69	2	3	9	5
April	86	1	9	13	6
May	64	2	2	4	7
June	89	1	1	6	7
July	74	0	0	2	6
August	80	0	0	3	13
September	72	0	0	5	4
October	70	1	1	9	7
November	80	4	9	12	8
December	88	0	0	7	7
	953	17	38	91	79

Instances in which Insurances were known to have been effected.

Upon the buildings and contents	488
Upon the building only	106
Upon the contents only	98
No insurance	261
	953
Chimneys on Fire	91
False alarms	79
Making the Total number of calls	1123

The *fatal fires* of last year were of a peculiarly unfortunate character, and the loss of life great. These calamities were attributable to:

	Fires.	Lives Lost.
Personal accidents from the ignition of wearing apparel ..	9	9
" " " fire sparks igniting bedding	3	3
" " " explosion of fireworks	2	7
Inability to escape from burning buildings, or killed in attempting to do so	3	19
	17	38

Perhaps no fatal fire ever presented such an accumulation of untoward circumstances as that which broke out at five o'clock on Tuesday morning, February 7th, in Princes-street, Leicester-square, which terminated fatally to no less than nine persons. On the discovery of the fire, a panic of fear prevented the inmates from making the slightest effort to escape, although the premises presented unusual facilities for doing so. The most remarkable circumstance, however, was that the panic extended to the police and numerous bystanders, who stood as helpless as the jeopardised inmates, to whom they offered no assistance. After reprehensible delay, a messenger was dispatched for the turncock *first*, and then for the parish engine of St. Ann's, which was found locked up under the care of the churchwarden, Mr. George. *After this*, the fire-escape of St. James's parish was sent for, but the conductor was away from his post, and time was lost in looking after him, and an opposite neighbour "quite forgot" he had a ladder on his premises until the fire was extinguished.* During this confusion, a man precipitated himself from a second-floor window, receiving fatal injuries in his descent; while another man, three women, and four children perished in the smoke and flames. An inquest was held before Mr. Bedford, the Coroner, when much indignation was expressed at the official neglect, of which these nine persons had fallen the victims. Mr. George, the churchwarden, was sent for to explain the circumstances under which he had deprived the neighbourhood of the protection of their parish-engine, and of the services of a most experienced and efficient fireman. Mr. George endeavoured to excuse himself upon the ground "that the parish-engines were now effete and useless, and that it was better to leave any fires that might occur, to be extinguished by the *fire-brigade!*" Whereupon, in conjunction with the churchwarden of St. James's, they had agreed to lock up their engines. Mr. Braidwood, at the request of the coroner, gave his opinion "that parish-engines, if well managed, would be very useful, and might be the means of saving an immense amount of life and property." After a lengthened inquiry, which created a most intense interest, the jury returned a verdict, "That the deceased persons died from burning, in the house of No. 19, Princes-street, on Tuesday last; but by what means the fire was caused, there was no evidence to show. And that it was their unanimous opinion, that some plan should be immediately adopted to insure the efficient use of the parish-engine at all times." Mr. Bedford, the coroner, said, "he quite agreed in that recommendation; at present the parish-engine was a complete mockery." Upon this, the Secretary of State for the Home Department gave directions that the churchwardens of St. Anne's should be prosecuted, under the Act 14 Geo. III., c. 78. Accordingly, Mr. George was summoned before Mr. Hardwick, at Marlborough-street Police-court; when Mr. Bodkin, who conducted the prosecution, said, "that when Lord Palmerston heard of the calamitous fire in Princes-street, he was horrified at the details; and on being informed of the absence of the parish-engine, and the cause, he directed proceedings to take place against the parish authorities, with the intimation that it was his determination to enforce the Act against all similarly offending parishes, without exception. Mr. George, having no grounds of defence, and finding the law too strong to be disregarded with impunity, promised acquiescence for the future, and the summons was ordered to stand over for a fortnight, on the understanding that if the offence now complained of then existed, the full penalty of £10 would be inflicted, and an additional £10 for every day the objectionable state of things continued. Within the fortnight, the engine was put in efficient repair, the engine-keeper reinstated, and in a few days afterwards promptly attended and extinguished a fire in the neighbourhood! Some few parishes, warned by these proceedings, furbished up their antiquated engines; but no further judicial proceedings were instituted, although in many other parishes (St. James's, Westminster, and St. Andrew's, Holborn, being notorious instances) the services of the parish-engines have not been forthcoming for many years past. Another extensive human sacrifice to these Molochs may, perhaps, call attention to the circumstance.

The next fatal fire occurred at half-past two o'clock on Saturday morning, April 29th, in the house of Mr. Brosette, beer-shop and lodging-house keeper, Colchester-street, Whitechapel. At the time of the outbreak, all the inmates were asleep in bed, and were aroused with difficulty to a sense of their danger. In a very few minutes, Conductor Wood was on the spot with the Royal Society's fire-escape; the fire was then raging throughout the back of the house, and smoke pouring from all the front windows. Wood instantly ascended, and entering the first-floor room, which was on fire, he discovered Mr. Brosette, his wife, and three children, almost insensible from the smoke and heat. Wood descended his ladder with Mrs. Brosette on his shoulders,

* *Vide* vol. 60, page 200.

and holding a child by its night-clothes in his mouth; again ascending, he re-entered the room, and having enabled the father to escape, descended with a child under each arm. The whole building then became enveloped in flames, rendering it impossible to extricate any of the other inmates. Before the arrival of the fire-escape, a man jumped from the upper window, and died in the London Hospital, from injuries received in falling, and from burns. The bodies of eight male lodgers were ultimately dug out of the ruins; and at a coroner's inquest held thereon, the jury returned the following verdict:—"That the deceased persons were burned to death in a house on fire, that occurred on the 29th of April last; but how and by what cause, no evidence hath appeared to the jurors. And the jurors cannot separate without expressing their deep sense of the services rendered by the fire-escape conductor, Wood*—the police, and others who rendered assistance in endeavouring to save the lives of all persons in danger; and particularly of those persons who assisted in clearing the ruins, to discover the bodies buried therein."

The third fatal fire, of this class, occurred on Sunday evening, November 19th, about 7 o'clock, in Red-lion-street, Holborn. The premises, a double house, Nos. 59 and 60, belonged to Messrs. Arnold and Co., watch and clock manufacturers. On the discovery of the fire, Mr. Jones, who occupied the second floor, succeeded in getting his wife and a child safely into the street; but one child being left behind, the anxious mother re-entered the house unperceived, and being unable to escape, both mother and son perished in the flames.

Among the personal accidents from the ignition of wearing apparel, one was of a very peculiar and distressing character. On the 10th of March, the premises of Mr. Brown, artists' colourman, 260, Oxford-street, were wilfully set on fire in two places—in a vault and in a back workshop—about 9 o'clock in the evening. The only persons on the premises being Miss Brown, a daughter of the proprietor, aged 20, and her grandmother. On the discovery of the fire in the vault, Miss Brown in the most courageous manner attempted to extinguish it by throwing on water; but venturing too near, the flames communicated to her clothes, and she was so much burned that, after lingering several days in great agony, death terminated her sufferings. A coroner's inquest returned the following verdict:—"That the deceased was burnt to death by the fire; and they are of opinion that the premises were wilfully set on fire by some person or persons unknown."

The Committee of Managers of the *Royal Society for the Protection of Life from Fire* are enabled to look back upon the past year with much satisfaction to themselves and to their subscribers. *Three hundred and fifty-one* fires have been attended by one or more of their fire-escapes, accompanied by a brave and experienced conductor; and thirty-eight persons have, by their instrumentality, been rescued from imminent peril, no other mode of escape remaining, viz.,

January 6th	No. 73, Cornhill	2	lives saved
„ 8th	9, Union-street, Bishopsgate	2	„
„ 11th	1, Colchester-street, Whitechapel	10	„
April 25th	33, Great Russell-street, Bloomsbury	1	„
„ 29th	1, Colchester-street, Whitechapel	5	„
May 28th	73, Snow-hill	1	„
July 14th	102, New-street, Gravel-lane, Houns-ditch	2	„
August 16th	Messrs. Cubitt's Factory, Thames-bank	1	„
October 16th	1, Old-street-road, Shoreditch	2	„
November 25th	23, Lambeth-hill	4	„
December 3rd	3, Arundel-street, Strand	4	„
„ 17th	17, Drury-lane	3	„
„ 22nd	144, Edgware-road	1	„
		38	

Immediately after the lamentable loss of life in Princes-street, a deputation waited upon the churchwardens of St. James's parish, and pointed out the public import-

* It was a most remarkable circumstance that *Wood* rescued the same family, under similar circumstances, from the same building, on the 11th January preceding; five other persons, lodgers, being also then saved. After the second fire, a meeting was held in Whitechapel, by the inhabitants of that locality, who expressed their high estimation of the fire-escape conductor's heroic services, by presenting him with the sum of £20, a silver watch bearing a suitable inscription, and a handsome Bible.

ance of placing their present useless fire-escape* under the Society's management; *vested interests*, however, being interfered with by such an arrangement, it is postponed to a "more convenient season." In order, however, to guard as much as possible against a similar catastrophe, the Royal Society immediately established a fire-escape station in Conduit-street, on the border of St. James's parish.

During the past year, a fire-escape station has also been established in Tower-street, City, making the present number of stations *forty-two*. The Society hope, eventually, so to complete the fire-escape arrangements of the metropolis, as to have one stationed throughout the night within a quarter of a mile of every house; they are of opinion that fifty-five stations will effect this desirable end, and to supply the thirteen still wanted, is an object of the Society's greatest solicitude. To this end they are now devoting all surplus funds; and to assist them in so desirable an object, they especially solicit the aid of the wealthy and humane. The benefits of a fire-escape station are so highly appreciated by the inhabitants of their several localities, that there is little doubt of their being well supported when once established. "To make this excellent scheme complete," says the writer, in the *Quarterly Review*, "only thirteen stations have now to be established, at a cost of about eighty pounds each; the charitable could not give their money in a more worthy cause than in furnishing these districts, in which many thousands of inhabitants are still exposed to the most horrible of all deaths." The greatest practical difficulty the fire-escape conductors have to contend with, is the great and unpardonable delay which is too often permitted to occur before their services are applied for. In very many cases of fire, the routine adopted by those whose duty it is to know better, is to call *first* the *turncock*, then the *fire-engines*, and *lastly* the *fire-escape!*

The following tabular analysis exhibits, in each instance, the occupancy of that part of the premises in which the fire originated, illustrating the comparative liability to accident by fire of various trades, manufactories, and private dwellings:

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Apothecaries, and dealers in drugs, but no chemical works carried on	—	4	6	10
Bakers	—	9	11	20
Boat and barge builders	—	—	2	2
Bath keepers	—	1	—	1
Beershops	1	10	2	13
Booksellers, binders, and stationers	—	10	16	26
Bottle merchants	—	—	1	1
Brewers	—	—	1	1
Brokers, and dealers in old clothes	1	2	3	6
Builders	3	3	4	10
Butchers	—	—	1	1
Cabinet makers	1	9	5	15
Cane dyers	—	2	—	2
Caoutchouc manufacturers	—	—	1	1
Carpenters and workers in wood	5	20	21	46
Chandlers	—	13	19	32
Charcoal and coke, dealers in	—	—	1	1
Churches and chapels	1	—	2	3
Cheesemongers	—	—	3	3
Chemists, using laboratories	—	1	2	3
Coachmakers	—	1	1	2
Coal merchants	1	—	2	3
Coffee-shops and chop-houses	—	2	8	10
Coopers	—	3	5	8

* The inutility of this parish escape was painfully manifested at fatal fires in Wardour-street, Soho, *vide* vol. 50, page 250; and in Moor-street, Soho, *vide* vol. 58, page 184, as well as at the more recent catastrophe in Princes-street.

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Cork-cutters	2	3	1	6
Cornchandlers	—	3	2	5
Curriers and leather-dressers	—	2	—	2
Distillers	—	1	2	3
———, tar	—	2	—	2
Docks	—	1	—	1
Drapers, linen and woollen	—	9	16	25
Druggists, wholesale	1	2	5	8
Dwellings, private (lodgings, 97)	1	52	245	298
Dyers	—	2	1	3
Eating-houses	1	2	2	5
Engineers, mechanical	—	2	6	8
Farming stock	2	3	—	5
Fellmongers	—	—	1	1
Firewood manufactory, patent	—	—	1	1
Firework-makers	1	1	1	3
Flax-dressers	—	1	—	1
Founders	—	2	2	4
French warehouses, fancy	—	1	1	2
Furriers and skin-dyers	—	1	3	4
Gas-works	—	1	1	2
Glass-blowers	—	1	1	2
Grocers	—	1	4	5
Hat-makers	—	5	3	8
Hemp-dressers	1	1	—	2
Horsehair merchants	—	—	2	2
Hotels and club-houses	—	1	4	5
Ink-makers	—	—	1	1
Japanners	—	3	—	3
Laundresses	1	—	—	1
Lucifer-match-makers	—	1	—	1
Lunatic asylums	—	2	—	2
Marine stores, dealers in	—	1	4	5
Mattress-makers	—	—	1	1
Milliners and dressmakers	—	5	6	11
Musical instrument-makers	—	3	2	5
Oil and colourmen; not colour-makers	—	11	20	31
Painted baize-makers	—	1	—	1
Painters, plumbers, and glaziers	—	2	2	4
Pastrycooks and confectioners	—	—	1	1
Pawnbrokers	—	1	1	2
Pipemakers	—	1	—	1
Playing-card-makers	—	—	1	1
Pork-butchers	—	—	1	1
Printers, letter-press	—	6	6	12
———, copper-plate	—	1	—	1
Public places of resort (not theatres)	—	2	—	2
Rag-merchants	1	2	2	5
Railways	—	2	3	5
Rope-makers	—	4	1	5
Sail-makers	—	1	—	1
Sale-shops, and offices	—	12	33	45
Sack-makers	—	—	2	2
Saw-mills, steam	—	3	2	5
Schools	1	1	1	3
Ships	—	1	—	1
——, steam	—	1	—	1

Occupation.	Totally Destroyed.	Seriously Damaged.	Slightly Damaged.	Total.
Ship-builders	—	—	1	1
—— chandlers	—	1	1	2
Soot merchants	—	—	3	3
Stables	3	8	6	17
Straw bonnet-makers	—	—	1	1
Sugar refiners	—	1	—	1
Tailors	—	10	7	17
Tallow-chandlers, melters, and soap-boilers	—	—	3	3
Tanners	—	1	—	1
Tarpaulin manufacturers	—	—	2	2
Theatres	—	—	2	2
Tinmen, braziers, and smiths	—	3	11	14
Timber merchants	—	1	1	2
Tobacconists	1	2	5	8
Toy warehouse	—	1	—	1
Type-founders	—	1	—	1
Unoccupied	—	—	4	4
Under repair or building	1	—	7	8
Upholsterers	—	5	4	9
Varnish-makers	—	—	1	1
Victuallers, licensed	1	4	28	33
Wadding manufacturers	—	1	—	1
Warehouses	—	1	—	1
————, Manchester	—	2	4	6
Waterproof canvas-makers	—	1	3	4
Weavers	—	3	—	3
Wharfingers	—	—	3	3
Whiting-makers	—	—	1	1
Windmill	1	—	—	1
Wine and spirit merchants	—	2	2	4
Wool-staplers	—	—	1	1
Workhouses	—	1	1	2
Workshops, not hazardous	—	1	1	2
Total	32	307	614	953

(To be continued.)

SOCIETY OF ARTS, MANUFACTURES, ETC.

SPECIAL PRIZES.

In addition to the General Premium List, the Council has determined to offer special prizes as follow:

For two pounds of the best and finest FLAX THREAD, spun by machinery, suitable for lace-making. *Twenty-five pounds, or a Gold Medal of the same value.*

NOTE.—The Committee of the Normal Lace School of Ireland will be requested to report on the specimens submitted.

For the best Essay on the Means of Preventing the NUISANCE of SMOKE arising from fires and furnaces; treating the subject practically, reviewing the various plans which have been put forth as remedies, with the experience of their success or failure, and the results of their adoption as to expense or economy, in erection and in working. The legislative measures necessary for the prevention of the nuisance, and the causes of the failure of the local acts for its suppression, should also form part of the Essay. *Twenty-five pounds, or a Gold Medal of the same value.*

NOTE.—The two foregoing prizes of £25 each, have been placed by Benjamin Oliviera, Esq., M.P., at the disposal of the Council for premiums during the year 1855.

For a COMPOSITION for the feeding rollers used in printing paper-hangings by cylinder machinery, similar in consistency and action to those used in letter-press printing, but adapted for working in water-colours. *The Society's Medal and five pounds.*

NOTE.—This premium has been placed at the disposal of the Council by S. M. Hubert, Esq.

For a "School" MICROSCOPE, to be sold to the public at a price not exceeding 10*s.* 6*d.* *The Society's Medal.*

To be a simple microscope, furnished with powers as low as those of a pocket-magnifier, for the purpose of observing flowers, insects, &c., without dissection. The lenses should range from two inches to one-eighth of an inch; the focal adjustment to be by rack-work, extending sufficiently above the stage to allow a thick object to be brought under the lowest power. It should be furnished with plyers, a concave mirror, and an illuminating lens, also a live box, or instead of it, two or three glass cells of different depths, a few slips of common glass, and a few pieces of thin glass for covers.

Makers are requested to state at what additional price they will undertake to supply a doublet of 1-16th or 1-20th of an inch, applicable to any instrument as above described.

For a Teacher's or Student's MICROSCOPE, to be sold to the public at a price not exceeding 3*l.* 3*s.* *The Society's Medal.*

To be a compound Achromatic Microscope, with two eye-pieces and two object glasses, one magnifying 120 diameters with the lower eye-piece, the other magnifying 25 diameters with the lower eye-piece. It should be furnished with a diaphragm, having various-sized openings, mirror, side illuminator, live box, forceps stage and case.

In the event of the Medal being awarded, the Council is prepared to take 100 of the smaller and 50 of the larger Microscopes, at the trade discount.

The instruments for which the medals shall have been awarded will be retained by the Society as standards, and the successful competitors must enter into a guarantee to supply their Microscopes at the foregoing prices, and of equal quality with those retained, and to change them if not found satisfactory.

The Council, in all cases, expressly reserves the power of withholding the Premium or Medal altogether, should the Essays and articles sent in competition not be considered worthy of reward.

The Essays and Articles intended for competition, must be delivered, addressed to the Secretary, at the Society's house, free of expense, on or before the 1st of May, 1855.

By order,

P. LE NEVE FOSTER, *Secretary.*

Society's House, Adelphi, London,
Jan. 31st, 1855.

EXHIBITION OF INVENTIONS.

The Seventh Annual Exhibition of Inventions is fixed to open to the public on Monday, the 2nd of April next. These Exhibitions of the Society have now for so long formed part of its general action, and are so well known, that it is scarcely necessary to enlarge on the object and advantages of forming the collection. It may, however, be stated, that the importance of exhibitions of this character has long been pointed out, and the experience of the Great Exhibition afforded the unmistakeable testimony of fact in support of the arguments in favour of their utility.

Limited as the Society's Exhibitions necessarily are, being dependent entirely on the voluntary assistance of the inventors themselves, they at least show the practicability of the idea, whilst their utility has been unquestioned. It is hoped that members and others will exert themselves to render the forthcoming Exhibition as complete as possible.

Articles for exhibition, consisting of specimens, models, and drawings of inventions, must be sent in not later than Monday, the 19th March, and applications for space by intending exhibitors should be made to the Secretary as early as possible.

AN IMPROVED WROUGHT-IRON PISTON.

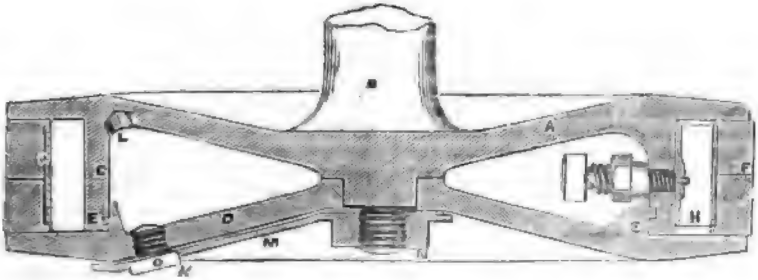
BY MR. J. E. M'CONNELL, OF WOLVERTON.*

THIS piston is constructed entirely of wrought iron, and it is forged in one piece with the piston-rod, by means of which the ordinary joint between the piston and piston-rod is avoided, and a great saving of weight is effected.

The construction is shown by the accompanying engraving, which represents an 18-inch piston for a locomotive engine. Fig. 1 is a transverse section of the piston. Fig. 2, a sectional plan, showing the interior on a more reduced scale. The body of the piston, A A, is a circular disc of wrought-iron, which is forged under the steam-hammer, with a portion of the piston-rod, B, formed upon it, about 9 inches long, to

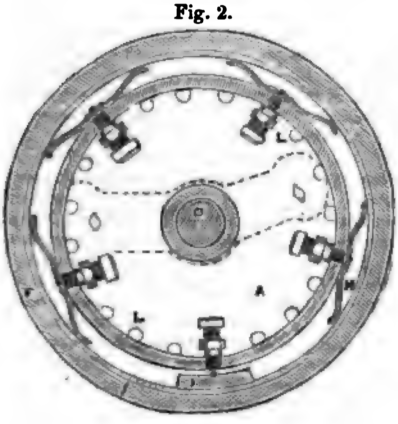
* Read at the Institution of Mechanical Engineers, Birmingham.

Fig. 1.



which the piston-rod is afterwards welded. The circular ring, C C, is also raised upon the disc in the forging, thus completing the body of the piston in one solid piece of wrought-iron. The wrought-iron cover

Fig. 2.

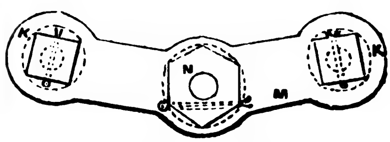


D D, is screwed into the ring, C C, by a single thread, cut upon the projecting rim, E E, on the inner side of the cover. The cover is dished in the centre, as well as the body of the piston, so that the two sides meet in the centre, to diminish the weight of material.

The packing consists of two plain brass rings, F F, lined with a thin steel hoop, G, which fit into a shallow recess on the inside of the brass rings. The four steel springs, H H, are set out against the packing, by set screws fixed in the ring of the piston, C C. The fifth set screw is attached to a solid block, I, which is placed at the bottom of the piston, and serves to support the weight of the piston, to prevent it from fluting the cylinder.

Two holes, K K, are provided in the cover for the purpose of unscrewing it, by means of a bar passed through either hole, K, and bearing at the point in a series of holes, L L, sunk in the opposite side of the piston. The holes, K K, are closed by brass screwed plugs, which are kept from turning by a thin brass plate, M, fixed by split pins, as shown in the detached plan, fig. 3. This plate also secures the brass locking-nut, N, for preventing the cylinder-cover from unscrewing; the thread of this nut is right-handed, whilst the main thread of the cover is left-handed.

Fig. 3.



The weight of this piston, including the piston-rod, is 217 lbs. for the size shown, 18 inches diameter, which is 89 lbs. lighter than the ordinary construction of pistons of the same size, weighing 306 lbs. The weight of a 16-inch wrought-iron piston and rod is 160 lbs., being 47 lbs. lighter than the ordinary construction.

This saving of weight amounts to 178 lbs. in the pair of 18-inch pistons, and 94 lbs. in the 16-inch pistons, which is a point of considerable importance at the high speed of 600 to 800 feet per minute, at which locomotive-engine pistons are driven; the consequent reduction of momentum adding to the durability of the working parts by reducing the strain upon them, as well as diminishing the disturbing effect upon the motion of the engine.

The solid construction of this piston avoids all risk of accident from the piston working loose upon the rod, which in the ordinary construction is liable to cause the fracture of the cylinder covers, and sometimes more extensive injury.

There are upwards of 200 of these pistons

now in use, and some of them have been at work for two years. The lightness of the piston, and the accuracy of adjustment maintained throughout, in consequence of the absence of joints and loose parts in the construction, allow the brass packing-rings to be worn down to a greater extent than usual, before requiring renewal. These rings (of which specimens were exhibited to the meeting) have been worn down to ⅛th inch from the original thickness, ⅜ths inch, and lasted twelve months in constant work.

ON PROPULSION BY JETS OF WATER.

To the Editor of the Mechanics' Magazine.

SIR,—Your article on the above subject, in the last number of your Magazine, has, I assure you, been read with much interest by many who have recently interested themselves in several systems of jet propulsion brought prominently before the public. It appears to me that if Mr. Gravatt's reasonings are fully disposed of, we shall not have occasion to trouble ourselves much with these various systems, although one at least of them has been backed up by a powerful company; for Mr. Gravatt is almost the only inventor who bases his contrivance on mathematical investigations, and challenges others to discuss his theory. I am not now about to attempt to add to the fulness of your able remarks already referred to, but purpose simply offering a consideration or two, which occurred to me on reading Mr. Gravatt's published letter to his friend. I may be in error in my opinions, and if so, shall be most happy to receive correction.

In the first place, I am quite at a loss to discover what possible advantage can be gained by employing steam power in the manner proposed by Mr. Gravatt; viz., in forcing water through an orifice, by raising the water up a certain distance and then allowing it to fall down again. Do we not all know that we must do precisely the same work to raise a given body of water through a height h, as gravity does in carrying it down through the same height? And if so, where is the use of Mr. Gravatt's tank and its appendages? Why should he not employ his steam power in the much more convenient method of forcing the water directly through the orifice?

I very clearly see that, as you say, "Mr. Gravatt's grand point is his *assumption* that 'the counter pressure of an effluent stream of water is double the pressure of the column of the fluid due to the velocity,'" and I also *fancy I see, that* this is his grand *error* also. But even taking his "cataract" example surely that gentleman must admit that it can matter but little whether the pressure on the sides of the vessel about the orifice is produced by the action of gravity upon the fluid above, or by the action of a steam-driven piston.

But, without insisting upon this point, I am bound to say, that I am in the condition you predicted, Sir, and find myself quite unable to deem the explanation (professedly borrowed from Newton) of the above "grand point" satisfactory. I do not know, at present, whether, in 1686, Newton taught, that when an orifice is opened in the bottom of a vessel containing a fluid, the bottom itself is relieved of a pressure equal to twice the weight of the column of fluid superincumbent above the orifice! I can only say, that I suspect Mr. Gravatt has seriously misapprehended something that Newton really did teach; and I am inclined to receive this explanation of the matter, from the fact, that, in the demonstration given by Mr. Gravatt, on page 8 of his letter, the cataract (F G H I) is dragged in so unceremoniously, and the steps of the integration performed are given so rudely, that the whole matter seems to be but imperfectly comprehended by the writer. The "other demonstration" which follows the former, also points, in my judgment, to the same fact, from the curious way in which the symbol, f, appears indiscriminately in velocities, forces, spaces, &c.

Now, a word or two about the "Medea" example. Taking p = pressure in lbs., to keep the boat at the velocity v_1, and n = the ratio of v_2 to v_1, and employing for the remaining elements, the notation preserved by you in your article, after getting out certain values from his formulæ, Mr. Gravatt goes on to say:—"Now, without going further, take as an example the 'Medea' paddle-wheel steam frigate" (sloop?) "of 843 tuns burden and 14·5 feet draught, where it has been said,

$$p = 4500 \text{ lbs.}, \; v_1 = 16,$$

and the horse power 220, but which, I believe, is nearer 330.

$$\text{Let } n = 1{\cdot}5, \text{ then } p = 16^2 a_1 = 4500,$$
$$\text{or, } a_1 = 17{\cdot}6, \text{ and } a_2 = 11{\cdot}7$$
$$v_1 = 16\,; \; v_2 = 24.$$

The horse power

$$= \frac{1{\cdot}25}{550} \times 17{\cdot}6 \times 16^3 = 164 \text{ nearly.}$$

This result is, of course, exclusive of friction; but here is a large margin, although n is not taken so small as it might be; and when we consider the draught for this mode

of propulsion need not be more than 4 feet, &c."

Now, I should like to know the value of that "where it has been said." Who said it? And how it was obtained? It appears to me, that it could only have been arrived at by making certain deductions from the indicated horse-power; and, if so, what importance is to be attached to it?

Perfectly agreeing with Mr. Gravatt, as to the general disadvantages of paddle-wheels in ships of war, and the inapplicability of screws to vessels of shallow draught, I am, nevertheless, unable to believe that he has not totally misconceived the real merits and demerits of jet-propulsion.

I am, Sir, yours, &c.,

OBSERVER.

February 5, 1855.

INVESTIGATION OF THE MOON'S MOTION.*

(Concluded from p. 84.)

To the Editor of the Mechanics' Magazine.

SIR,—We have hitherto considered the moon in the same manner as we are accustomed to consider the comparatively small bodies with which we meet on the surface of the earth, and we have been led to the conclusion that no point in it possesses the properties of the centre of gravity of *such* bodies.

Nevertheless we can show (the hypothesis of the moon being a perfect homogeneous sphere still subsisting) that the moon would rotate uniformly on any one of its diameters; for if no forces whatever act on the moon, such a motion will continue, when once begun, in consequence of inertia; and, according to D'Alembert's principle, this motion will not be disturbed if we add the two forces, C G, C E (fig. 1, the centre C being at rest, and the earth rotating on axis, A), and therefore, according to our principle (on page 82) such rotation can exist when C revolves round the earth.

Now it is time to consider the moon as it is in reality, viz., as an imperfect heterogeneous sphere (not even composed of homogeneous concentric shells). The rotation we have just been speaking of is no more possible; for only bodies enclosed by surfaces of revolution can rotate on an axis so as to occupy constantly the same space; and besides, the resultant of the attractions from the earth would now vary with every position of the moon, therefore not constantly cut its axis, and consequently disturb the rotation. This is true, whatever point be now taken to replace the former moon's centre. Applying our principle, we conclude now also that the real moon can only revolve round the earth's centre as if it was rigidly connected to that point.

And, lastly, a word more on our principle itself. I shall choose the moon's motion for exemplifying its meaning.

We refer again to fig. 1. The moon is at rest, and the earth rotates uniformly on its axis, projected at A. Take the latter axis as axis of y, A E as axis of z, and a perpendicular to the plane, y A z, drawn through A, as axis of x. Now, suppose another movable system of co-ordinates produced by changing in the first, $+x$ into $-x$, and by letting the same system be carried on by the earth in its rotation. Entirely disregarding now the first system, let us refer fig. 1 to the second. Then one and the same dynamical phenomenon has occurred in two different systems of co-ordinates; and since the use of any such system is only to *fix space* for us, if I may use that expression (absolute space being as inconceivable to us as absolute motion), the meaning of saying that from different causes bodies have the same dynamical relation, must be quite clear.

Taking, now, the first system of co-ordinates again, we see that the transmitting of the said dynamical phenomenon to the new system has produced the following effects:—Firstly, to bring the earth at rest; secondly, to produce the often-defined motion of the moon; thirdly, to engender a new centripetal force, equal in intensity to and coinciding in direction with C G. This new force being equal and directly opposite to the *still subsisting force*, C E, we may, according to D'Alembert's principle, take them both away. And now the already-described motion of the moon exists under the influence of the unaltered attraction,

* I am not acquainted with Mr. Evan Hopkins' new theories, but it will be seen from the present paper that my belief is, that a mechanical explanation of the peculiarity of the moon's motion can be given. Humboldt, in his "Kosmos," has already given such an explanation; but the hypotheses he makes to that end do not seem to have found favour. (See *Edinburgh Review*, No. 175, page 192, and Sir J. Herschel's "Outlines of Astronomy," 4th edition, page 262.) The celebrated Daniel Bernouilli, in his "*Traité sur le Flux et Reflux de la Mer* (...... *Dissertationes quæ Præmio fuère condecoratæ à celebri Parisiensi Scientiarum Academiâ*,") says:—(I found this work only four days ago at the Cambridge University Library, at the end of an edition of Newton's "Principia," published at Geneva in 1742)—"*Mais quelle idée y peut-on attacher*—(speaking of the words—*Centre de gravité*) *lorsque la pesanteur est inégale dans les différentes parties du corps? Il n'y a aucun point alors qu'on puisse nommer tel, quelque définition qu'on donne à ce mot.*" And a little further, speaking of the peculiarity of the moon's motion:—"*quand même la lune serait parfaitement homogène, sa seule figure, jointe à l'inégalité de pesanteur de ses parties vers le centre de la terre, pourrait même produire le phénomène en question.*" He does not, however, carry out a full proof of his assertion. These quotations, from such an authority, confirming what I said before, may well justify my continuing here my investigation.—C. J. R.

C G, from the earth, in confirmation of our principle.

I might apply the same principle to the consideration of the elliptical motion of the moon round the earth, and show that only the regularly recurring phenomenon of libration interferes with our above conclusions; which phenomenon may in fact be called simply a *geometrical* consequence of elliptic revolution. We can, however, consider the discussion of this point as belonging to a general investigation of elliptical motion.

From a moral point of view, it also seems natural that the motion of a satellite should thus be a subordinate one. The agreement of a mechanical law with a moral proposition, can only be a display of the infinite wisdom of Him who created all things.

The reason why the present investigation cannot be applied to the case of the sun and planets, is, that the latter appear so very small, as seen from the first, that there can be no objection to speak of their centre of gravity. And why does not the earth show always the same face to the moon? Because the gravity of the earth towards the moon is so small in comparison to the mass of the earth, that the trifling variations of this gravity can only produce a very small periodical perturbation in the earth's existing rotation.

This is, Sir, what I have judged indispensable for making my investigation an intelligible *whole*. Having done this, I shall on no account write to you any more on the subject, for fear I might, indirectly, revive a controversy, which is disagreeable to you, and, no doubt, to most of your readers. I am, Sir, yours, &c.,

C. J. Recordon.

Cambridge, Feb. 5, 1855.

SAFETY-VALVES.

To the Editor of the Mechanics' Magazine.

Sir,—I am glad to see from the tone of the letters published in your journal, that attention is likely to be drawn to the number of "Re-inventions" that are constantly appearing before the public. The examples of similarity are too numerous to mention, but I cannot refrain from drawing a parallel between two inventions (one of which was specially mentioned in your journal a short time ago) for a more efficient safety-valve. I could give the names of the patentees and the dates, but this would not add anything to the facts. The principle of the just-mentioned valves is as follows: The valve is made perfectly spherical, and rests upon a narrow "seat" of brass let into the top of an upright standard pipe, fixed on the boiler. The weight required for the pressure is suspended from lugs cast on the valve, or by means of a saddle made to form a cap for the valve. In one case they are suspended from the lugs, by means of a pipe of larger diameter than the standard above-mentioned, and having an aperture in the top for the escape of waste steam. In the other case they are suspended by four rods, and the weights are cast in segments. Now the only other difference between these two valves consists in one being encased in a shell, with a whistle to act by the escape of the waste steam, and the other having the weights exposed, the steam escaping at once without noise: still they each profess to claim the spherical valve, having the weights so suspended to be used for such purpose. In this case, how are the public and users to judge who is the true inventor, or whom to pay patent right to? This, Sir, is only one solitary case; but, as I said before, there are many such parallels in the inventive world, take any direction you will. Look, for instance, at the numerous arrangements for that all-absorbing question, "smoke combustion." Again, see the number of such cases in connection with the steam engine and boiler. Since the adaptations of the steam engine made by Watt, how many patents have been obtained for all kinds of imaginary improvements, and yet in what distinctive feature does the steam engine differ now from what it was when it first left his master mind? Some slight alterations and additions may certainly have been made; but to term all improvements, is simply preposterous. Now in all this "multiplication-table" system of invention, you will admit, there is a great amount of true and energetic talent wasted, that might, and would be, avoided by a scrutinising examination of the inventors' claims to novelty, before the patent is granted at all. The patent agent ought also to render all his experience and advice to warn the inventor that his invention is or is not new.

I doubt not the publication of the specifications by the "Commissioners" as at present done, will remove some of the evils under which all intending patentees labour; but yet these are not quite so accessible as they might, and must be, before the above state of the case is improved. Certainly we could do very well without a "great host" of the re-inventions now so prominently put forth; the great majority containing no new principle, but being simply a slight (very slight) alteration, for the purpose of swallowing up the share of the patent right.

I shall be glad to see the matter brought conspicuously before inventors, and the public generally, and as your aid in these cases is freely given, it will not require me to ask for the insertion of this letter.

I am, Sir, yours, &c.,

Engineer.

Manchester, Jan. 31, 1855.

PRODUCTS FROM COAL—BENZINE.

The following letter by Dr. Hofmann has been elicited by a discussion in the pages of the *Journal of the Society of Arts*, similar to that already published by ourselves, on the above subject:

Sir,—I notice in your Journal, No. 110, page 104, a letter by Mr. Mansfield, quoting and remarking on a passage from a paper by Mr. F. Crace Calvert, in a former number. I observe also, at page 131, a note from Mr. Calvert in answer to this letter.

I am exceedingly unwilling, and it is quite contrary to my habit, to take part in controversy. I am not now about to break my rule, but I feel bound to ask you to insert the following remarks in your next number. I think it my duty to do so, not only on general grounds of justice, but because the experiments of Mr. Mansfield, to which he refers in the letter which I first mentioned, were made by that gentleman in my laboratory, at the Royal College of Chemistry, and because I watched the tedious process which Mr. Mansfield patiently carried on for many months, and by which he obtained, amongst other interesting results, the facts which he truly states to have been his discovery.

I am disposed to regret the tone of warmth which appears in Mr. Mansfield's letter. I must, however, point out, that the few words in which Mr. Calvert replies to Mr. Mansfield's strictures in no way meet the objection which Mr. Mansfield raises to Mr. Calvert's statement concerning "Benzine." The chief points to which Mr. Mansfield calls attention in his letter, are circumstances of scientific history and of literary fact. He appeals on this matter to the only tribunal which can consider it—that of science.

Such questions as the following are not subjects for Courts of Law: Are "Benzine" and "Benzole" accepted synonyms? Who gave the name "Benzine" to a product contained in coal-naphtha? Is "Benzine" coal-naphtha purified, or is it a peculiar substance? Who first found "Benzine" in useful quantity in coal-naphtha? Who first pointed out its utility as a solvent of grease and as a detergent? Who first introduced it into England?

These are the main points raised in Mr. Mansfield's letter against Mr. Calvert's statement. The answers to these questions are matters of history, and not of law; and I am bound to declare, that the assertions made by Mr. Mansfield regarding these points are in every respect exactly correct.

It is true that Mr. Mansfield, in his letter, raises by implication a secondary question, as to the validity of Mr. Calvert's recent patent. On this question, of course, I have nothing to say; this is simply a matter for legal decision; but, in the present case, it is only a subordinate question, and to merge the first dispute in the second, which is altogether beside it, appears to me an evasion of the point at issue.

I am, Sir, yours, &c.,
A. W. Hofmann.

Royal College of Chemistry, Jan. 24, 1855.

ARMSTRONG'S SMOKELESS FURNACE.

To the Editor of the Mechanics' Magazine.

Sir,—Seeing in your last week's "Provisional Specifications not proceeded with," one for consuming smoke (p. 115), to which my name is attached, will you allow the correction of an error in the abstract there given. You say, "the inventor proposes to feed the furnace through a certain passage with air heated by passing between the fire-bars and a *fixed* plate." Now the word "fixed" ought to have been "*moveable*, and turning upon a joint or hinge," which are the actual words used in the specification; an important difference you will admit, and curious from the fact that it was alleged to infringe on previous patents, with *fixed* plates in a similar position.

I am, Sir, yours, &c.,
Robert Armstrong.

65, Fenchurch-street, Feb. 5, 1855.

SHILLIBEER'S PATENT HEARSES.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Friday, February 2, 1855.

Mr. Shillibeer appeared in person, and prayed an extension of his patent for hearses, the merit of which he represented to consist in the combination of a hearse and a mourning coach in one carriage.

Mr. Pemberton Leigh said that their Lordships saw no such merit in the invention as to induce them to recommend a prolongation of the patent.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Bishop, William, of Boston, Lincolnshire, gentleman. *Improvements in machinery or apparatus for ticketing or labelling spools, parcels of the same, or other similar parcels.* Patent dated July 14, 1854. (No. 1546.)

The inventor describes a box containing damping-pads, which are kept moist by means of capillary action.

Sewell, Charles, of Longton-lodge,

Longton-grove, Sydenham, Kent, builder. *An improvement in spring hinges for doors and gates.* Patent dated July 14, 1854. (No. 1547.)

Claim.—The application of a rod of steel or other suitable material as a spring to door and gate hinges, so as to cause the doors and gates to be closed by the torsion of the rod.

McGaffin, John, of Liverpool, Lancaster, engineer. *Improvements in the mode of corrugating angular iron.* Patent dated July 14, 1854. (No. 1549.)

This invention "consists in the manufacture of corrugated wrought-iron angle T or H, or any such forms of rolled iron, with all or any of the flanges corrugated." The corrugations are formed either during the process of rolling the iron in dies made with the requisite sized corrugations, or by passing the iron, after it is rolled into the first forms, through a set of suitable rollers.

McGaffin, John, of Liverpool, Lancaster, engineer. *Improvements in the construction of iron bridges.* Patent dated July 14, 1854. (No. 1550.)

This invention consists in constructing iron bridges or roofs by riveting or screw-bolting corrugated plates of iron together, placing the sheets across the place to be bridged. Several of these sets of sheets are placed over each other, the spaces between them being filled in.

Derham, James, of Bradford, York, manager. *Improved machinery for combing wool and other fibrous substances.* Patent dated July 14, 1854. (No. 1551.)

This invention consists in combining apparatus so as to operate upon a continuous sliver, and draw off the fibrous material under operation in detached slivers, fit for the preparing machine, leaving the noil and dirt between the comb teeth; and in the use of a travelling fork or its equivalent, for clearing the combs of the noils and dirt extracted from the fibrous material under operation.

Price, Astley Paston, of Margate, Kent, chemist. *Improvements in the distillation of wood and of other vegetable substances.* Patent dated July 14, 1854. (No. 1552.)

This invention consists in so constructing and arranging the distilling apparatus that the process of distillation may be rendered continuous, that is to say, that the wood or other vegetable matter having been subjected to the action of heat, and the distillation of the volatile products being effected, the resulting charcoal, which is at a red heat, is made to pass or to descend into a portion of the retort or distilling apparatus, and allowed to cool down to a temperature at which combustion will not take place, *fresh supplies* of material being fed in.

Dechanet, Jean Baptiste, and Antoine Dominique Sisco, of Paris, France, gentleman. *Certain improvements in the construction of railway carriages.* Patent dated July 14, 1854. (No. 1553.)

This invention comprises certain means of constructing wheels for railway carriages with flanged tyres, and wrought or rolled iron disks, and the employment of short axles with two journals carrying only one wheel.

Brindley, Elijah Henry, of Longton, Stafford, engraver. *Certain improvements in printing or ornamenting china, earthenware, and glass.* Patent dated July 15, 1854. (No. 1554.)

This invention consists in the use of flexible and elastic blocks or types, by which the patterns or portions of a pattern required to be produced upon the material may be readily adapted to the shape of the article the surface of which is to be ornamented.

Wright, Thomas, of George-yard, Lombard-street, London, engineer. *Improvements in the permanent way of railways.* Patent dated July 15, 1854. (No. 1558.)

This invention mainly consists in a mode of constructing sleepers by forming them in one piece of cast or wrought iron, in the shape of a rectangular bed-plate or framing, with longitudinal and transverse bearing surfaces, the two rails being sustained on one sleeper; or by casting or uniting in one piece the two collateral sleepers of a double line of railway.

Ashworth, John, of Turton, Lancaster, cotton-spinner. *Certain improvements in apparatus to be employed in the construction of the permanent way of railways.* Patent dated July 15, 1854. (No. 1559.)

This invention mainly consists in the use of a certain bar or plate, which fits the sides of the rail, and in a mode of fixing or securing it against the rail by means of set screws and lock-nuts.

Kelsey, George Wade, of Hope-farm, near Folkstone, Kent. *Improvements in air-engines.* Patent dated July 15, 1854. (No. 1562.)

This invention relates to that class of engines where the power is obtained by the expansion of air, and consists in a mode of expanding the air in the chamber by means of a flame of gas inside of the latter.

Wagstaffe, Matthew French, of Walcot-place West, Lambeth, Surrey, surgeon, and John William Perkins, analytical chemist, of Poplar-terrace, Poplar, Middlesex. *Improvements in obtaining metals from ores and oxides.* Patent dated July 15, 1854. (No. 1563.)

This invention consists in acting upon metallic ores or metallic oxides by various mineral acids, "the acids acting upon me-

tallic ores or oxides by the action of voltaic electricity, so as to dissolve out and disintegrate from the matrix each metal contained therein in succession, in accordance with their respective degrees of solubility in such acids respectively, and the metals are obtained direct, or the metals are afterwards obtained from their solutions by precipitation, by means of voltaic electricity, after the separation of the metals from the solutions. The acid solutions are to be neutralized by fixed alkalies, whereby neutral salts of the alkalies so used are obtained in a commercial state."

SPIRES, JOSEPH, of Cleveland-street, Fitzroy-square, Middlesex, gunmaker. *Improvements applicable to boots and shoes.* Patent dated July 15, 1854. (No. 1564.)

The inventor describes an improved rotary heel, which consists of a circular metal plate which is fixed to the heel of the boot or shoe, and of a concentric metal ring or tip which surrounds the fixed plate, and is held in its place by a shoulder or otherwise, so that it may be made to rotate or move round when required. The inventor also describes an instrument for rotating the heel.

DENTON, JOHN BAILEY, of London and Stevenage. *Improved hoes and spuds.* Patent dated July 17, 1854. (No. 1565.)

These improved hoes or spuds are formed with holders for containing liquids known to have the effect of destroying vegetable life, or liquids known to promote vegetation when applied to cultivated plants.

WOODYATT, THOMAS MAYOS, of Kniver Mills, Stafford, screw-manufacturer. *An improvement or improvements in consuming or suppressing the smoke of steam-engine boiler and other furnaces.* Patent dated July 17, 1854. (No. 1566.)

The inventor introduces air to the gases through a horizontal perforated plate placed between two bridges, at their lower parts.

NORTH, GEORGE, of Lewisham-road, Kent, coach-builder. *An improved apparatus to be attached to garments for protecting watches, purses, and other articles from being stolen from the person.* Patent dated July 17, 1854. (No. 1567.)

The inventor employs a plate fitted with a spring, and a catch abutting against the spring, the two being secured to the plate by rivets which pass through the plate and extend so far beyond its under surface as to be capable of being passed through the garment, and through a second plate on the inside of the garment, and fastened by means of a bar.

WARCUP, WILLIAM, of Lyndhurst-Villa, Coronation-road, Bristol, Somerset, contractor. *Improvements in the construction of springs for carriages and similar purposes.* Patent dated July 17, 1854. (No. 1568.)

This invention, which is an improvement upon one patented May 26, 1853, consists in connecting "V, U, or open-angular double-blade springs" to a plate secured to the under side of the carriage-wagon or engine-framing, instead of fitting them into the interior of a spring box.

LOCKHART, JOHN, junior, of Paisley, Renfrew, wood-turner. *Improvements in the manufacture of bobbins.* Patent dated July 17, 1854. (No. 1569.)

Claims—1. A mode of cutting out bobbin blanks from a block, by means of a revolving, tubular, or crown saw or cutter, fixed to and working in conjunction with a central drill, and combined with a moveable internal ejecting piece for thrusting the cut blank out of the tubular cutter.—2. Certain mechanism for feeding or shifting the wood up to the cutting tools.—3. A mode of simultaneously cutting out and drilling blanks, by means of a rotatory tubular saw, with a central drill, or borer, working therein.—4. The use, in cutting out bobbin blanks, of an internal ejecting piece, working in or through the tubular or crown saw, for clearing out the severed blank.

LIVESEY, JOHN, of New Lenton, Nottingham, lace maker. *Improvements in lace machinery, and in fabrics manufactured by such machinery.* Patent dated July 17, 1854. (No. 1571.)

This invention consists—1. In improvements in, and improved arrangements of, the cutting apparatus used in lace machinery for cutting the pile fabrics formed thereon. 2. In improvements in the instruments used in lace machinery, and arrangements for working the same, in order to form pile or loops, by which the inventor produces much longer pile or loops than have heretofore been made by such instruments, and which lengthened pile or loops may be cut or separated by drawing out a thread, and so forming a fringe. 3. In the production of a fabric made from lace machinery, combining the long loop or pile fabrics forming fringes as aforesaid, with a loading of lace-work, having velvet ornaments upon it, or with a head of velvet only to such fringes.

HORNSBY, RICHARD, of Spittlegate Ironworks, Grantham, Lincoln. *An improvement in the straw-shaking apparatus of threshing machines.* Patent dated July 18, 1854. (No. 1576.)

This invention consists in applying, at intervals, in straw shakers, surfaces rising above the general level of the shakers, by which the straw, as it proceeds towards the back ends of the latter, is to be thrown up and opened out.

BELLFORD, AUGUSTE EDOUARD LORA-

DOUX, of Castle-street, London. *A new kind of piston.* (A communication.) Patent dated July 18, 1854. (No. 1577.)

The patentee describes "a prismatic, cylindrical, or other-shaped piston or embolus, which is fixed to, or to which is secured a bag or diaphragm of any suitable flexible material. The said diaphragm is secured in any convenient way to the inside of a cylinder or prismatic tube or pipe, in which the above said piston or embolus is capable of performing or reciprocating motion."

JOHNSON, WILLIAM BECKETT, manager for Messrs. Ormerod and Son, of Manchester, Lancaster, engineers and ironfounders. *Improvements in steam engines.* Patent dated July 18, 1854. (No. 1580.)

Claims—1. An arrangement of engine, in which the condenser is placed under the cylinder.—2. An arrangement in which the air-pump is placed under the cylinder.—3. As applied to disc, throttle, or regulating valves, forming the openings through which the steam passes, of a curvilinear or other form, whereby the arrears of the openings are caused to increase in a greater ratio than the motion imparted to the valve.—4. As applied to the same valves, adapting the spindle which communicates motion thereto, loosely to the moveable part, but so as to impart the necessary rotatory or vibratory motion.—5. The application to the metal lids of air and feed pump valves of a piece of vulcanized or other India rubber, which arrives in contact with a stop upon the opening of the valve.—6. The application of vulcanized or other India rubber as a check or stop, for preventing air and feed pump valves from opening too far.

BROWNE, JOHN COLLIS, physician, of Rodney-terrace, Cheltenham, Gloucester. *Improvements in the manufacture of camp-bedsteads.* Patent dated July 19, 1854. (No. 1584.)

The side rails of the inventor's bedstead are divided in their length, and jointed by hinges, so that one part folds upon the other.

WHITELEY, JONAS, JOHN SLATER, and WILLIAM HENRY CROSSLEY, all of Halifax, York. *Improvements in machinery or apparatus for preparing and spinning wool and other fibrous substances.* Patent dated July 19, 1854. (No. 1585.)

These improvements consist in so arranging and combining apparatus employed in preparing and spinning fibrous substances, that continuous support may be given to the fibre between the feed-rollers and the nip, for drawing off by a suitable surface travelling in the same direction as the fibre.

LONGLEY, JAMES, of Hunslet-road, Leeds, York. *A machine for turning and finishing tubs, pails, casks, and other wooden vessels of an elliptic, oval, or other eccentric form.* Patent dated July 19, 1854. (No. 1586.)

This machine consists of an oscillating or vibratory lathe, supported on or suspended from a driving-shaft by two carrying-bars through one end of each of which the driving-shaft revolves, the other ends forming head-stocks, in which the lathe-shaft works. Rotation is imparted to the lathe-shaft by a band direct from the pulley on the driving-shaft, the vibratory motion to produce the eccentric action being obtained by means of a cog-wheel set on the lathe-shaft or mandril, and communicating motion to another cog-wheel on a top carrying-bar, the axis of which works an arm of a crank, the other arm of which is fixed, and the revolution of the crank produces the reciprocating motion required.

BALL, WILLIAM, of Rothwell, Kettering, Northampton, ironfounder and agricultural implement maker. *Improvements in drills.* Patent dated July 19, 1854. (No. 1587.)

Claim.—Constructing drills with cast-iron press-wheels running on a spindle, for the purpose of pressing grooves or furrows on ploughed land on the flat to receive the grain or other seed.

SUDBURY, JOHN, of Halsted, Essex, and SAMUEL WRIGHT, of Clare, Sussex, gas-engineer. *Improvements in taps and valves, and in the method of working them for the purpose of regulating the passage of fluids.* Patent dated July 20, 1854. (No. 1590.)

The first part of these improvements relates to those valves which move always parallel to their seats, and consists in opening and closing them more gradually than usual; and the regulation of the passage of gas and other fluids is effected by means of a small receiver, which floats in water or other suitable fluid, and is subject internally to the pressure of the gas, so that according as the latter is at a greater or less pressure, the receiver rises and falls, and becomes more or less immersed, and the receiver of the regulator is suitably connected with the valve through which the supply of gas has to pass, so that when the pressure increases the passage is diminished, and *vice versâ.*

ROBERTS, RICHARD, of Manchester, engineer. *Improvements in machinery for preparing to be spun cotton and other fibres.* Patent dated July 20, 1854. (No. 1591.)

Claims.—1. The use of a travelling web to contain and bring forward fresh portions of fibre to a toothed cylinder, for detaching the fibre from seed or other impurities. 2. The use of a sheet metal cylinder having serrated or toothed perforations for the same purpose. 3. The use of ventilating drums, when they are placed at such an

elevation above the beater as to allow the current of air towards the drums to carry the fibre upwards, so that in its progress forwards it shall afford time for impurities to descend into the dust chambers. 4. The use of ventilating endless webs or wire fabrics, also elevated as above, &c., &c.

GILLET, JEAN BARTHELEMY, of Agde (Hérault), France. *Improvements in capstans, winches, and windlasses.* Patent dated July 20, 1854. (No. 1592.)

These improvements consist in constructing a pair of windlasses or capstans, which are moved by spur gearing from a central shaft on which moveable drivers of different diameters are keyed, so that by shifting these drivers different speeds may be imparted to the capstan, and a greater or less power obtained.

BARNES, JOSEPH, of Church, Lancaster, coal proprietor. *Certain improvements in furnaces or fire-places.* Patent dated July 20, 1854. (No. 1594.)

The inventor constructs furnaces or fire-places with certain hollow bars, so arranged as to allow of the circulation of water through them.

WHITEHEAD, FRANCIS, and WILLIAM WHITEHEAD, both of Crayford, Kent, engineers. *Improvements in safety lamps.* Patent dated July 20, 1854. (No. 1595.)

This invention consists in constructing the frame or body of safety-lamps of solid sheet metal—in surrounding the upper portions of safety-lamps with an extra outer casing—in placing a fixed deflector on the inside of safety-lamps,—and in certain arrangements for extinguishing such lamps when any attempt is made to get at the light.

CHAMBERS, THOMAS, jun., of Colkirk, Fakenham, Norfolk. *Improvements in machinery for distributing manure.* Patent dated July 21, 1854. (No. 1598.)

Outside of the hopper into which the manure is fed, and near the bottom of it, is arranged a cylinder composed of numerous short portions, each having three or other convenient number of inclined blades protruding short distances from its periphery, the extent of their protrusion being capable of adjustment in order to regulate the quantity of manure thrown off by them. Certain arrangements of scrapers and stirrers are used in connection with the foregoing.

LILLIE, SIR JOHN SCOTT, C.B., of Pall-mall, Middlesex. *Improvements in fire-arms.* Patent dated July 21, 1854. (No. 1599.)

These improvements consist in providing portable rests, so as to insure a better aim for troops in action with small arms. For this purpose the inventor attaches a bayonet or sword to the musket by means of a hinge and a metallic band or slide, which, by means of a thumb-spring, will move from the centre to the muzzle, and enable the point of the scabbard to be placed against the breast or hip of the marksman.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

GARDISSAL, CHARLES DURAND, of Boulevart St. Martin, Paris, France. *A stamp safe.* Application dated July 12, 1854. (No. 1533.)

The inventor describes a box which can be opened on one side, so that the different kinds of stamps may be wound on the different rollers, and the opposite side of which has apertures, so as to allow the stamps to be withdrawn as they are used.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in preserving animal substances.* (A communication.) Application dated July 12, 1854. (No. 1534.)

The inventor employs sulphurous acid and water for preserving animal substances.

FLITCROFT, WILLIAM, of Bolton, Lancaster, manufacturer, and THOMAS EVANS, of Manchester, same county, printer. *Improvements in printing and finishing floor-cloths, or any other fabrics or materials printed in oil colours.* (A communication.) Application dated July 13, 1854. (No. 1535.)

Instead of using the two printing blocks for each colour, viz., a colour-block and a blotch-block, the inventors use only one colour-block, and afterwards one finishing or flushing-block which flushes all the colours at once.

LAWSON, LIONEL, of Paris, France, manufacturer. *Improvements in printing.* Application dated July 13, 1854. (No. 1539.)

This invention consists in using heated inks for typographical purposes.

WIBERG, MARTIN, of Lund, Sweden, but now of Myddleton-square, Middlesex, doctor of philosophy. *Improvements in the construction, setting up, and distribution of types for printing.* Application dated July 14, 1854. (No. 1548.)

The inventor proposes to construct apparatus by means of which "the setting and distribution may be simultaneously effected."

TAYLOR, JAMES, of Burnley, Lancaster, cabinet-maker. *An improved clothes peg.* (A communication.) Application dated July 15, 1854. (No. 1555.)

The inventor connects two pieces of wood or other suitable material, and places a spring between them.

WALLER, RALPH, of Manchester, merchant and manufacturer. *Improvements in the manufacture of letters and figures, and of ornamental signboards and other tablets,*

and in affixing letters, figures, or ornaments to glass. Application dated July 15, 1854. (No. 1556.)

The first of these improvements consist in stamping letters and figures of copper or other suitable sheet metal in basso relievo; the second in fixing every description of letters, figures, or ornaments, on mirrors or plates of silvered glass; and the third in affixing letters, &c., to glass, by means of pins, which pass into holes drilled in the glass.

GUYARD, FRANCOIS VICTOR, engineer-captain to the town of Gravelines, France. *Certain improvements in the electro-telegraphic communications for preventing mischances during the passage of trains on railways.* Application dated July 15, 1854. (No. 1557.)

On the tender or engine, or one of the carriages in each train, the inventor places a projecting arm carrying two metallic brushes, free to revolve. By this means a connection is made between the wires and one pole of a galvanic battery, or other source of electricity on the train, the other pole of which battery is connected with one of the axles, and through it with the earth, for the purpose of making signals.

SUMMERFIELD, THOMAS, of Birmingham, Warwick, glass-manufacturer. *The manufacture of chromatic glass and glass-faced bricks, which said bricks are applicable to face-work or fronts of buildings, basements, pilasters, string courses, door and window-heads, modillions, cornices in part or whole, or other purposes where a superior finish and durability are required; a part of which is also applicable to bricks made wholly of clay.* Application dated July 15, 1854. (No. 1560.)

This invention relates mainly to the making of bricks wholly of a suitable compound, so as to resemble marble or stone in colour and appearance, the basis of which compound will be principally glass.

HUNT, WILLIAM, of Tipton, Stafford, manufacturing chemist. *Improvements in utilizing certain compounds produced in the process of galvanizing iron, and in the application of the same and similar compounds to certain useful purposes.* Application dated July 15, 1854. (No. 1561.)

This invention consists in using chloride of zinc in place of sal-ammoniac in coating iron with zinc or other metals, and in recovering the sulphuric acid which has been used in cleaning the iron; also in the use of a solution of chloride of zinc for washing the iron in, after cleaning and previous to coating.

FOWLER, JOHN, the younger, of Temple-gate, Bristol, agricultural implement maker. *Improvements in draining ploughs.* Application dated July 17, 1854. (No. 1570.)

This invention consists in attaching to a drain plough, apparatus by means of which the coulter is progressively raised or lowered at a regulated speed by the action of the machine itself, so as to suit the inclination of the ground over which the plough is travelling, and which is at all times indicated by an apparatus attached to the machine.

BARLOW, JAMES, of Accrington, Lancaster, machinist. *Improvements in the mode or method of extracting gluten from wheat or flour and preparing the residuum for sizing purposes.* Application dated July 18, 1854. (No. 1572.)

The inventor mixes flour into dough and places it in a slotted cylinder or trough, into which he injects water, so that as the barrel with the dough revolves, the water acts upon the latter and separates the gluten and starch, leaving the former in the barrel, and allowing the latter to fall through the slots.

HITCHINS, HENRY, of King William-street, London, engineer, and WILLIAM BATLEY, of Dean-street, Middlesex, mechanic. *Certain combinations of materials suitable for mouldings and medallions and to be employed as a substitute for wood, gutta percha, and other like materials.* Application dated July 18, 1854. (No. 1573.)

This invention consists in combining shavings of wood, ivory, bone, and other substances, with glue or other adhesive matter, and, where desirable, with essences and perfumes.

HILL, MARY CAROLINE, of Dublin, milliner. *An improvement in bonnets and in bonnet frames.* Application dated July 18, 1854. (No. 1574.)

The improvement in bonnets consists in so constructing them by means of sliding frames, as to form either a small or a large bonnet. The improvement in bonnet frames consists in forming those parts of the frames which run from back to front of two or more pieces, made to slide one within the other, or side by side.

ARCHER, CHARLES MAYBURY, gentleman of the press, of St. James's-gardens, Haverstock-hill, Middlesex. *Treating all kinds of paper whereon any printing, engraving, engrossing, letter writing, or lithographing has been printed or impressed, so that the said printing, engraving, engrossing, letter-writing, or lithographing may be completely removed, discharged, or obliterated from the said paper, so that the said paper may be readily re-used in sheets, or be re-converted amd worked up again into its primitive pulp, by the ordinary method, and be again manufactured into and be used as paper.* Application dated July 18, 1854. (No. 1575.)

Mr. Archer takes any kind of printed paper, and immerses it for a given period in a bath or solution of pure sulphuric or other acid, which "acts upon or eats its way into

the oil, lamp-black, &c., of which printers' ink is composed, and so gradually decomposes or discharges it from the paper by a gradual evolution and efflorescence."

TWIGG, GEORGE, and ARTHUR LUCAS SILVESTER, of Birmingham, Warwick, manufacturers. *Improvements in apparatus or machinery for stamping or pressing metals.* Application dated July 18, 1854. (No. 1578.)

These improvements consist in an arrangement of mechanical parts composed of a lever working on friction-rollers, a connecting rod, and an eccentric. The friction-rollers are coupled together by a cam, through which the pin of the rollers passes, and the lever works the punch or stamping die. The feed apparatus consists of a double parallel motion and slide-bar attached to the connecting rod.

CATO, PETER, of Liverpool, Lancaster, ship-builder. *An improved trough or manger for holding the provender of horses, cattle, and other animals.* Application dated July 18, 1854. (No. 1579.)

This invention consists in making the troughs or mangers of earthenware or stoneware, and so forming the inside that the animal may, without difficulty, be able to gather up all the provender.

DALGETY, ALEXANDER, of Florence-road, Deptford, Kent, engineer. *Improvements in the reduction of friction.* Application dated July 18, 1854. (No. 1581.)

This invention consists of a peculiar arrangement of anti-friction rollers, which are interposed between rubbing working surfaces.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in zincography.* (A communication.) Application dated July 18, 1854. (No. 1582.)

This invention consists in producing, by electro-galvanic agency, designs in relief on plates of zinc, from which impressions may be taken by an ordinary printing-press, in the same manner as from wood engravings or stereotypes, or from which moulds may be taken to be employed in the formation of cliché plates by the galvano-plastic process.

PROVISIONAL PROTECTIONS.

Dated November 10, 1854.

2389. Edward William Kemble Turner, of Praed-street, Paddington, Middlesex. Improvements in separating liquids or fluids from substances or matters, part of which improvements are also applicable to other purposes where the air-pump has been hitherto employed.

Dated November 20, 1854.

2451. Henry Diaper, of St. Michael's-terrace, Pimlico, Middlesex, gentleman. The application of a new material to the manufacture of paper.

Dated November 25, 1854.

2495. John Simon Holland, of Woolwich, Kent, engineer. Improvements in large and small fire-arms, and in the preparation of their charges.

Dated November 29, 1854.

2513. John Moore Hyde, of Bristol, iron ship-builder. Improvements in iron steam ships, and in boilers and machinery for propelling the same.

Dated November 30, 1854.

2519. John Mason, of Rochdale, Lancaster, machinist, and Leonard Kaberry, of Rochdale, manager. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.

Dated December 21, 1854.

2695. Andrew Smith, of Princes-street, St. Martin's-in-the-Fields, engineer, and James Thompson Mackenzie, of Lombard-street, Middlesex, merchant. Improvements in ordnance and small arms, by applying thereto projectile force obtained from high-pressure steam.

Dated December 23, 1854.

2717. Thomas Heppleston, of Manchester, Lancaster, hat-trimming manufacturer. Improvements in machinery or apparatus for stretching and finishing silk or woollen yarns or threads in the hank or skein.

Dated December 26, 1854.

2723. Philip Patton Blyth, of Upper Wimpole-street Middlesex, gentleman. An improved application of materials to the construction of screw propellers.

Dated January 12, 1855.

80. John Onions, of Wellington-place, Black-friars-road, Southwark, ironfounder. Certain improvements in the construction of pipes and tubes for the use of smoking tobacco and cigars.

Dated January 18, 1855.

129. Constant Jouffroy Dumćry, of Paris, France. Improvements in smoke-preventing apparatus.

130. John Bailey Surgey, of Lidlington place, St. Pancras, Middlesex. Certain improvements in carriages.

131. Thomas Blackwood and Andrew Gordon, both of Paisley, Renfrew, engineers. Improvements in motive-power engines.

132. William Lancaster, of Preston, Lancaster, cotton-manufacturer. Improvements in "temples" employed in the manufacture of textile fabrics.

133. Evan Leigh, of Collyhurst, Lancaster, machine-maker. Certain improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.

134. Henry Partridge and John Benjamin Broome, of Birmingham, Warwick, gun-manufacturers. Certain improvements in the manufacture of wrought-iron ordnance.

135. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the application, treatment, cleansing, and dyeing of fibrous substances and products. A communication.

136. William Pidding, of Putney, Surrey. Improvements in the manufacture of combs for the human hair.

137. William Pidding, of Putney, Surrey. Improvements in the manufacture of building materials, and in the machinery or apparatus for making the same.

138. William Pidding, of Putney, Surrey. Improvements in coverings for the feet of bipeds and quadrupeds.

139. James Gray Lawrie, of Glasgow, engineer. Improvements in the sights of fire-arms and cannon.

140. Michael Josef Nyilassy, of Chandos-street, Covent-garden, Middlesex. Improvements in wind musical instruments in the nature of the bugle and the trumpet.

141. Samuel Alexander Bell and John Black, of Bow-lane, Cheapside, London, vesta-light manufacturers. An improvement in the manufacture of congreve or lucifer matches.

Dated January 19, 1855.

142. Charles Frederick Stansbury, of Cornhill, London. Improvements in the construction and operation of self-acting railway breaks. A communication from James J. McComb, of New Orleans, United States of America.

143. Stanislaus Joseph Paris, of Manchester, embosser. Improvements in machinery for embossing.

144. Robert Martin, of High-street, Tottenham, Middlesex, and Jacob Hyams, of Union-street, Bishopsgate. Improvements in goloshes or overshoes.

145. Samuel Isaacs, of Newman-street, Oxford-street, Middlesex. Improvements in the manufacture of artificial coral.

146. John Irwin Clarke, of Windsor-court, Monkwell-street, Middlesex. Improvements in applying colour to the edges of leather gloves. A communication from Francis Moat, of Grenoble.

147. Joseph Abbott, of Smallbrooke-street, manufacturer, and Henry Holland, of Steelhouse-lane, manufacturer, both of Birmingham. Improvements in preventing the sinking of vessels at sea or on rivers, and in raising of sunken vessels.

149. Thomas Coëndoz Hill, of Stanton Lacy, Shropshire, gentleman. An improvement in drain pipes and tiles.

150. Pierre Charles Paul Laurent-Préfontaine, gentleman, of Paris, French Empire. An improved engine, called hydraulic sling, for raising water and other liquids, or heavy bodies.

151. William Smith and Thomas Phillips, of Snow-hill, London, gas-engineers. Improvements in cocks or taps, and in balls or floats to be used therewith.

153. Matthew Boulton Rennie, of Whitehall-place, Middlesex. Improvements in preserving animal and vegetable substances for food. A communication.

Dated January 20, 1855.

155. William Douglas and John Carswell, of Manchester, Lancaster, dyers. Improvements in dyeing woven fabrics.

156. Scipion Salaville, of Paris, France, proprietor. An improved method of preserving and purifying grain and seed.

157. William Gore Pearce, of Grosvenor-street, Camberwell, Surrey. An improved method of projecting chain or coupled shot or shell from double and single barrel guns, and causing them to explode simultaneously by electricity and other means.

158. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in paddle-wheels for propelling vessels in water. A communication from John Upham Wallis, of Dansville, United States of America.

159. Frédéric Margueritte, chemist, of Paris, France. Improvements in the manufacture of soda and of potash.

160. William Eisenmann, merchant, of Berlin. A new construction for a hearth, applicable to all firing-constructions or fireplaces.

Dated January 22, 1855.

162. John Gedge, of Wellington-street South, Middlesex. Improvements in laminating metals, either in relief or bas-relief. A communication from Messrs. Tournel frères, of Saint Chamond, France.

164. Henry Carr, of Peterborough, Northampton, civil engineer. Certain improvements in railway crossings.

165. John Henry Pape, of Paris. Improvements in pianofortes.

167. Jacques Joseph Van Camp, of Paris, France. Improvements in pistons of steam engines.

168. François Arsène Vasnier, of Paris, France. Certain improvements in fireplaces.

169. Pierre Hippolyte Gustave Berard-Touzelin, of Paris, France, manufacturer. Improvements in the manufacture of artificial flowers.

170. William Kilgour, of Liverpool, Lancaster, merchant. An improved manufacture of naphtha, paraffine, and paraffine oil.

171. Peter Arkell, of Stockwell, Surrey, engineer. An improved mode of purifying whale and seal oils.

Dated January 23, 1855.

173. Frederic Prince, of South-parade, Chelsea, Middlesex. Improvements in cartridges for fire-arms.

175. Walter Sellwood, of Cheapside, London, draper. An improvement in spatterdashes.

177. George Brooks Pettit and Henry Fly Smith, both of New Oxford-street, Middlesex, gas-engineers. Improvements in stoves and other apparatus for generating heat from gas, and in the employment and removal of the vapours produced by its combustion.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

196. John Lamacraft, of Westbourne-grove, Middlesex, engraver. Improvements in envelopes or means for securing letters, notes, and similar documents. January 26, 1855.

208. Samuel Mayer, of Bristol, potter, and William Bush, of the same city, millwright. Improvements in reducing flint and other substances, rendering them suitable for the manufacture of porcelain and other earthenware articles. January 27, 1855.

213. Auguste Léopold Lenoir, of Paris, France. Improvements in breech-loading fire-arms. January 27, 1855.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENT.

A petition will be presented to Her Majesty in Council by Alphonse Rene le Mire de Normandy, of Judd-street, Middlesex, analytical and consulting chemist, praying Her Majesty to grant a prolongation of the letters patent granted to him 8th September, 1841, for "certain improvements in the manufacture of soap."

On the 12th March, or on the next day of sitting of the Judicial Committee of the Privy Council, if it do not sit on the day mentioned, an application will be made to that Committee to fix an early day for hearing the matters contained in the said petition; and any person desirous of being heard in opposition must enter a caveat to that effect in the Privy-council Office on or before that date.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 6th,* 1855.)

2085. William Hutchinson and William Barlow. Improvements in steam-boilers.

2086. William Beckett Johnson. Improvements in lamps and other apparatus used for illumination.

2087. George Crux. Improvements in the production of bonnets, children's hats, and similar coverings for the head.

2100. Gémis Filhon. Improvements in glass chimneys for gas-burners or lamps.

2118. William Tatham. Improvements in ma-

chinery or apparatus for preparing, spinning, doubling, twisting, and winding cotton, wool, flax, silk, and other fibrous substances.

2134. Thomas Crossley. An improved mode of manufacturing printing-blocks. A communication.

2141. Enoch Oldfield Tindall. Improvements in mangles and wringing machines, for smoothing and wringing clothes and woven fabrics.

2142. Thomas Harris. Separating the steam from the condensed water and mud in its transit from the boiler to the cylinder of a steam engine, stationary, or locomotive.

2243. Thomas Allan. Improvements in applying electricity.

2262. François Jean Bouwens. An improved rotary engine.

2270. William Henderson. Improvements in treating certain ores and alloys, and in obtaining products therefrom.

2301. Richard Archibald Brooman. Improvements in centrifugal machines, and in driving the same. A communication.

2366. Charles William Siemens. Improvements in electric telegraphs. A communication.

2426. Robert Wilson. A new or improved ornamental material or fabric.

2495. John Simon Holland. Improvements in large and small fire-arms, and in the preparation of their charges.

2602. William James Harvey. Improvements in fire-arms when revolving barrels are used.

2671. William Porter Dreaper. The improvement of the manufacture of pianofortes.

7. Antoine Roullion. Certain improvements in the manufacture of soap.

11. George Peacock. Improvements in constructing propellers for ships and other vessels.

41. Charles John Edwards and Frederick Frasi. An improved manufacture of bearings for carriage axles and shafts of machinery in general.

73. Edward Hall. Improvements in the manufacture of gunpowder.

79. Auguste Edouard Loradoux Bellford. Improvements in tanning. A communication from Messrs. Rene de Kercado Molac and Jean Daniel Friedel, of Strasbourg, France.

80. John Onions. Certain improvements in the construction of pipes and tubes for the use of smoking tobacco and cigars.

90. Richard Archibald Brooman. Certain means of devulcanizing India-rubber and other similar gums, or of treating such gums after having been vulcanized. A communication.

100. Joseph Edlyn Outridge. Improvements in transmitting motive power.

105. James Peter Lark. Improvements in effecting the combustion of fuel and the consumption of smoke in steam boiler and other furnaces.

111. James Yeoman. Improvements in self-feeding furnaces.

128. Lamorock Flower and George Augustus Dixon. Improvements in machinery or apparatus for sifting and cleansing.

129. Constant Jouffroy Duméry. Improvements in smoke-preventing apparatus.

131. Thomas Blackwood and Andrew Gordon. Improvements in motive power engines.

132. William Lancaster. Improvements in "temples" employed in the manufacture of textile fabrics.

144. Robert Martin and Jacob Hyams. Improvements in goloshes or overshoes.

145. Samuel Isaacs. Improvements in the manufacture of artificial coral.

146. John Irwin Clarke. Improvements in applying colour to the edges of leather gloves. A communication from Francis Moat, of Grenoble.

165. John Henry Pape. Improvements in pianofortes.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed February 2, 1855.

1708. Edward Hallen.
1716. Charles Frederick Stansbury.
1717. Charles Frederick Stansbury.
1718. Charles Frederick Stansbury.
1719. Charles Frederick Stansbury.
1749. John Hackett.
1803. Edward Trenery.
1901. William Symington.
2117. James Hammond.
2259. James Scott.
2457. Richard Knight.
2485. James Hartley.
2487. William Eley.
2523. Frederick Le Mesurier.
2531. William James Cantelo.
2533. Charles Iles.
2557. George Fergusson Wilson and John Chase Craddock.
2575. Nathaniel B. Carney.

Sealed February 3, 1855.

1458. Alexander Southwood Stocker.

Sealed February 6, 1855.

1734. Joseph Hulme.
1735. Henry Turner.
1736. Henry Moorhouse.
1742. William Charles Pitt.
1744. Plato Oulton.
1750. William Houghton Clabburn.
1753. Samuel Bickerton.
1754. Joseph Reimann and Friedrich Sauermann.
1766. John Petrie, junior.
1772. William Crosland.
1776. Benjamin O'Neale Stratford, Earl of Aldborough.
1790. John Lamb and Thomas Lamb.
1802. Sara Spaldin.
1812. Peter Armand Locomte de Fontainemoreau.
1814. William Ker and Matthew Ker.
1837. John Grist.
1840. Augustin Jacquelain.
1851. John Norton.
1858. William Brooke.
1943. Isaac Pim Trimble.
2306. Pierre Benoit Chapuis.
2318. Thomas Osborne and William Eldred.
2336. William Charles Theodore Schaeffer.
2361. George Davis.
2582. William Hawthorn.
2594. Nathaniel Johnston.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Jan. 9	3676	J. Thompson	Notting-hill	Camp-bedstead.
19	3677	J. E. Smith	Wood-street	Shirt-collar.
20	3678	R. W. George	Portman-square	Desk.
25	3679	W. Schnell	Denmark-street	Sofa-bed.
26	3680	R. Edwards	Bow	Polisher.
Feb. 3	3681	F. W. Lee	Fetter-lane	Cloak.
7	3682	T. C. Williams	Reading	Camp-stove.

LIST OF PROVISIONAL REGISTRATIONS.

Jan. 8	631	S. Potts	Birmingham	Pencil-case.
9	632	T. P. Hawkin	Birmingham	Chain.
11	633	H. Elliott	Birmingham	Sight.
19	634	S. Davidson	Pentonville	Triune protector.
23	635	W. Townsend	Coventry	Trivet.
30	636	F. Smith	Birmingham	Tap.
Feb. 7	637	R. Jacobs	Charing-cross	Parasol-joint.

NOTICES TO CORRESPONDENTS.

We have been compelled to postpone the publication of the letters of Mr. W. Baddeley, "Ingenieur," and others.

Z.—We do not think it necessary to publish your second communication.

T. C. H., Dublin.—We recommend Dr. Lardner's Handbook as the best work we know of on the subject.

C. J. C.—We cannot undertake to furnish you with the information you require.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co. Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1645.] SATURDAY, FEBRUARY 17, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

AN IMPROVED STEAM-ENGINE BOILER.

Fig. 2.

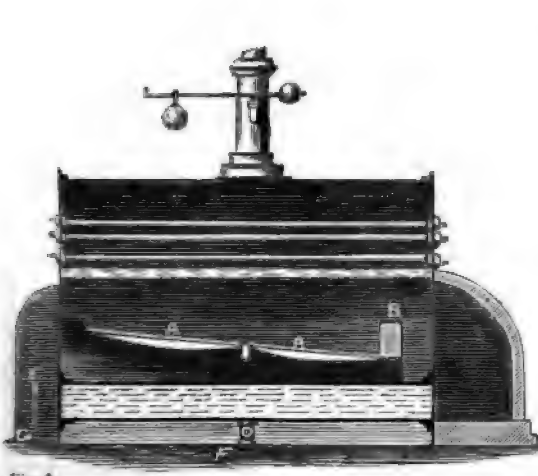


Fig. 1.

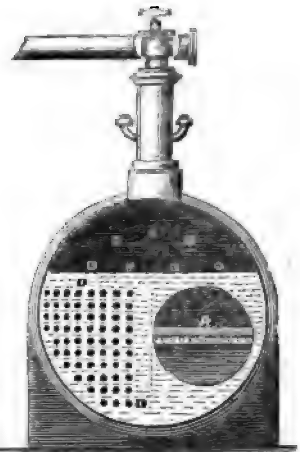


Fig. 3.

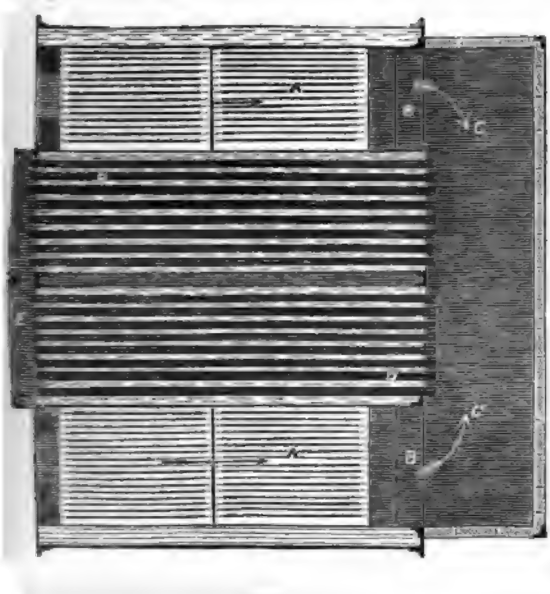
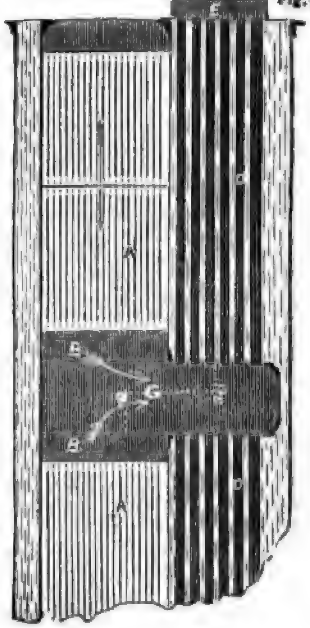


Fig. 4.



AN IMPROVED STEAM-ENGINE BOILER.

BY MR. H. WRIGHT, OF MANCHESTER.

THE boiler described in the present paper* (the invention of Mr. W. B. Johnson, of Manchester), has been at work successfully for more than twelve months at the author's Works, near Birmingham; and the present description has been laid before the Institution, as the boiler appears to possess some practical advantages in efficiency and economy.

It is one of the tubular construction of boilers, and has an improvement in the arrangement, designed for the purpose of removing some objections that have been experienced in tubular boilers, and increasing the economy both of working and construction.

The boiler is shown in the engravings on the preceding page, in which fig. 1 represents a transverse section; fig. 2, a longitudinal section; and fig. 3, a plan of the two boilers combined. The products of combustion from each furnace, after passing over the furnace-bridges, B B, meet and mix together in the chamber, D, attached to the back of the boiler; and when the furnaces are alternately supplied with a proper amount of the fuel, combustion is rendered sufficiently perfect to prevent the appearance of smoke from the chimney.

The motion given to the vapour in coming from each furnace, causes it to mix thoroughly together, after which it passes into the tubes, E E, forming the heating surface of the boilers. The products of combustion are collected from the tubes into the smoke-box, F, and conducted from thence by the flue, G, to the chimney. The smoke-box is fitted with a damper to regulate the draught through the tubes. Two furnaces and return tubes, giving similar results, are sometimes placed in one shell or boiler-casing; but the arrangement represented in the engravings is recommended as making a simple and strong boiler; for it must be apparent, that if the two furnaces and two sets of tubes contained in the two shells were placed in one, it must be considerably larger in diameter, and to that extent become unfit for the purpose of producing steam of high pressure. Many steam boilers have been constructed similar to this, and the result has been strongly in favour of tubular heating surface.

Another arrangement of the furnaces is shown in fig. 4, which is a plan. They are placed inside the shell of the boiler, are entirely surrounded with the water, are cylindrical in transverse section, are placed opposite to one another longitudinally, and are supplied with fuel at each end of the boiler. The products of combustion from each furnace, after passing over the furnace-bridges, B B, mix together in the chamber, G. When the furnaces contain a proper amount of fuel, and are alternately supplied, the consumption of the smoke is practically complete. From boilers of 30 horse-power and upwards, the amount of smoke produced is not more than appears at the top of an ordinary house chimney. The products of combustion, after mixing in the chamber, are conveyed through the tubes, D D, into the smoke-boxes, E E, and from thence into the flue, F F, communicating with the chimney. Each smoke-box is provided with a damper, G, by which each set of tubes can be regulated in the amount of heat they receive from the chamber.

The boilers described above, that are in use at the Author's works, have been in constant work for a year, with very satisfactory results. No failure has occurred of the tubes, or any other part, and the tubes are not found to choke up; the smoke being very completely burnt, the deposit of soot in the tubes is thereby prevented, and they have not required cleaning out since first starting work. These tubes are wrought-iron, 2 inches diameter, and 8 feet long.

The fuel consumed is saw-dust and rubbish of the carpenters' shops, with a small proportion of coal-slack, and the boiler is found to keep up the steam well, at 50 lbs. per inch. The construction of the boilers, and the arrangement of the two in combination, is found very serviceable in economy of fuel, allowing very inferior quality to be used, and the consumption of the smoke is accomplished very completely, scarcely any trace of smoke being visible, except for a short time when lighting the fire, or getting up a low fire.

---

* Read at the Institution of Mechanical Engineers, Birmingham.

LONDON FIRES IN 1854.

Twenty-fourth Annual Report. By Mr. William Baddeley, C. E.

(*Concluded from page* 129.)

THE daily distribution of last year was as follows:

Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.	Sunday.
132	123	150	136	134	141	137

Their distribution through the hours of day and night has been in the following proportions:

	First hour.	Second hour.	Third hour.	Fourth hour.	Fifth hour.	Sixth hour.	Seventh hour.	Eighth hour.	Ninth hour.	Tenth hour.	Eleventh hour.	Twelfth hour.
A.M.	56	54	53	46	33	22	21	18	14	16	18	19
P.M.	19	25	29	30	42	36	51	66	80	82	61	62

The *causes of fire*, so far as they could be satisfactorily ascertained, have been the following:

Accidents, unforeseen, and for the most part unavoidable	9
Apparel ignited on person	7
Candles, various accidents with	98
„ ignited bed-curtains	66
„ „ window-curtains	41
Carelessness, palpable instances of	11
Children playing with fire	8
„ „ „ lucifers	11
Cinders put away hot	18
Coke „ „	2
Copper improperly set	1
Fire-sparks	47
Fireworks, making of	3
„ letting off	1
Flues, foul and ignited	25
„ blocked up	9
„ defective or overheated	47
„ hot air	1
„ of hot plate	3
Friction of machinery	4
Fumigation, incautious	2
Furnaces	17
Gas, escape of from defective fittings	65
Gas, accidents in lighting	7
„ left burning too high, or near combustible goods	27
„ fitters at work	1
„ stove	1
Gunpowder, explosion of	1
Hearths laid on timber	7
„ fires kindled on	4
Hot-water pipe	1
Intoxication	9
Lamps, oil	4
„ naphtha	2
Lime-slaking	6
Linen, drying or airing before fire	34
Lights thrown down areas, &c.	16
Locomotive, sparks from	2
Lucifer-matches, making	2
„ using	10
„ accidentally ignited	11
„ „ „ by sun's heat	1
Ovens, defective or overheated	11
Pitch and tar, boiling of	12
Reading in bed	2

Shavings, loose ignited		43
Smoking in bed		1
,, meat		2
Spirits, drawing off		2
Spontaneous ignition of chemicals		3
,, ,,	cotton-waste	1
,, ,,	dung	2
,, ,,	greasy rubbish	5
,, ,,	lamp-black	6
,, ,,	wet rags	2
Steam boilers, heat from		4
Stoves, improperly set, defective, or overheated		26
,, drying		18
,, ironing		1
,, pipe		7
,, skeleton		1
Suspicious		9
Tobacco, unextinguished		39
Varnish, oils, &c., boiling of		18
Wilful		19
Unknown		77
		953

The causes of fire during the past year do not present any particular feature of novelty. The use of artificial light in the form of candles, gas, &c., continues to originate a large proportion of fires. A fire has again been occasioned by a *hot-water pipe*, and for the second time in the same locality; viz., Mercers'-hall, the scene of a similar accident in the previous year. "It is commonly imagined that the introduction of hot water, hot air, and steam-pipes, as a means of heating buildings, cuts off one avenue of danger from fire. This is an error. Iron pipes, often heated up to 400°, are placed in close contact with floors and skirting-boards, supported by slight diagonal props of wood, which a much lower degree of heat will suffice to ignite."*

Mr. Braidwood has stated his belief, that by long exposure to heat not much exceeding 212°, wood is brought into a condition that will fire without the application of a light; and that this process takes from eight to ten years. There is no doubt that such a process goes slowly on; but it is probably a much quicker one than Mr. Braidwood supposes; influenced, no doubt, by the temperature of the pipes, and modified by many other circumstances. There is much analogy between this slow charring and ultimate ignition, and the spontaneous ignition of various substances; as also to a circumstance which, for want of a better term, I call the *accumulative* property of heat, which manifests itself when large quantities of carbonaceous matters, heated much below the igniting point, are heaped together in bulk. This phenomena frequently takes place with hot charcoal, coke, roasted coffee, chicory, &c. In the course of a few hours it is no uncommon thing to find these substances, which had been previously cooled down so as to be handled without inconvenience, in a state of active combustion.

Nineteen of last year's fires are known to have been *wilfully* occasioned; in two instances only was the crime judicially brought home to the perpetrators. The first of these was the case of H. J. Hall, beer-shop keeper, in Fleet-street, whose premises were destroyed by fire, early on the morning of February 28th. Sufficient evidence, however, remained to show that the fire had been wilfully occasioned. It is notorious that the insurance offices in general "do not like the trouble or bad odour of being prosecutors," and in the present instance the incendiary nearly escaped. To the honour of some of the directors of the Westminster Fire-office, they felt they had a duty to perform to society, as well as to themselves; they caused Hall to be apprehended at Liverpool, where he was hiding, and at the August sessions of the Central Criminal Court convicted him of arson. Mr. Baron Martin, in passing sentence said, that the extent of injury that might have arisen from a fire in such a place as Fleet-street was incalculable, and the prisoner must have anticipated that, upon conviction, the heaviest sentence short of death would be passed upon him, and he should order him to be *transported for life*. The other incendiary was a journeyman printer, who having quarrelled with his employer, and been discharged from his service, set fire to his premises out of revenge, and then gave himself up to the police; he was convicted, and *transported for twenty years*.

The writer already quoted,* says, "There is no denying that the crime of *arson* owes its origin entirely to the introduction of fire-insurance; and there can be as little doubt, that of late years it has been very much increased by the pernicious competition for business among the younger offices. It is calculated that *one* fire in *seven* which occur among the small class of shopkeepers in London, is an incendiary fire. When an event of the kind 'is going to happen' at home, a common circumstance is to find that the fond parent has treated the whole of his family to the theatre."

The excessive competition above alluded to, which has for some time past been carried on, for the most part in "hazardous" and "special" risks, has entailed heavy losses in some of the competing offices, and they

* *Quarterly Review*, No. cxci.

* *Quarterly Review.*

have in consequence abandoned the *fire* business altogether. The actual risk in certain classes of insurances is very unsatisfactorily determined—being settled, apparently, by the rule of thumb! I have now before me, an announcement that the *Lancashire* Insurance Company are open to any proposal for insurance on goods in the "Crystal Palace," Sydenham, at 10*s.* 6*d.* per cent. premium!

This building is composed principally of iron and glass, the floors being almost the only combustible part—without any sly corners for incipient fires to breed in unperceived—wholly exempt from the greater number of "causes from fire" hereinbefore enumerated—abundantly supplied with water both within and without the building—watched and guarded day and night by experienced firemen, and containing a larger supply of available fire-extinguishing machinery than is to be found in any provincial town in the kingdom (Liverpool and Manchester only excepted); and here the risk of destruction by fire, to goods deposited therein, *was* estimated at one guinea, and as now reduced *is* estimated, by the office alluded to, at half a guinea per cent.! Looking from the terrace of the said Crystal Palace, there may be seen a private dwelling, occupied by two families, having fires and candles in every floor, liable to all the numerous accidents which they occasion, the only supply of water being that from a small pump, and the nearest fire-engine station upwards of nine miles distant; and yet, all the risk of fire in this building is considered amply covered by a premium of *two shillings* per cent! On comparing these two widely-different risks together, it would seem as if the one premium must be ruinous; the other excessive, if not fraudulent. So far, however, from the lower premium being ruinous, it is, according to a report by Mr. Barnes, surveyor,* twice as much as the actual risk demands; and he recommends such insurances to be taken at *one shilling* per cent.—or, if the house be isolated, or semi-detached, at *ninepence*.

Because, says Mr. Barnes, "The instance of a dwelling-house having been on fire, is almost a solitary one, and when it has occurred, the injury has been mostly of a very partial character. I have rarely heard of injury done to dwelling-houses, and when I have, it has formed the *exception* to an almost universal rule." During the last twenty-one years these *exceptions* have amounted to 5,942! During the year just ended, one private dwelling was totally destroyed; 52 seriously damaged, and 245 slightly damaged. Mr. Barnes admits that he has no *data* whereon to found his recommendation, but says, "It is difficult, indeed next to impossible, to furnish any statistical report of the number and amount of risks by fire of this class of assurance, owing to the slender means I have at my command."*

Mr. Barnes supposes a very large number of private dwellings in the metropolis and its suburbs, insurable at the *shilling* rate; but there is no doubt the number is much exaggerated; and of the actual number, a very large proportion are bound, by leases and other circumstances, to existing offices. Therefore "every one" will *not* "insure his dwelling-house in the office that charges the most moderate premium." Again, the "most moderate premium" may, after all, involve a fallacy!

Take the ordinary case of a dwelling-house insured for

	£		s.	d.	£	s.	d.
	300	at	1	6..	0	4	6
Contents of ditto	500	at	1	6..	0	7	6
Duty upon	800	at	3	0..	1	4	0
					£1	16	0

On removing this insurance to Mr. Barnes' office, as he charges 2s. upon the contents, the account will stand thus:

	£		s.	d.	£	s.	d.
House	300	at	1	0 ..	0	3	0
Contents	500	at	2	0 ..	0	10	0
Duty	800	at	3	0 ..	1	4	0
					£1	17	0

That is, just *one shilling more* than is charged by the present insurers!

Mr. Barnes says, "no doubt exists in my mind that these properties are greatly *under-insured*, owing to the rate of insurance being unquestionably beyond the risk." But cannot Mr. Barnes perceive that, if the *rate* be beyond the risk, the reduction in the *amount*, in a great measure, restores the equilibrium?

The dwelling-house before alluded to, is doubtless *under-insured*, its value being full £500; but taking the probability of its total destruction as very remote, an insurance for £300 is commercially considered to be amply sufficient. If ALL private dwellings (*without lodgers*†) and their contents were insured at their *full value*, there can be no doubt that insurances at a shilling premium would be a profitable business; but then comes the *duty!*

* Report to the Directors of the London Mercantile Assurance Company; to be had gratis at No. 4, Gresham-street, and at No. 3, Church-court, Old Jewry, London.

* Reference to the *Mechanics' Magazine* would have furnished the information required.

† Mr. Barnes says, "Lodgers do *not* destroy the single occupancy." I hold that they do.

Taking the house before alluded to:

	£		s.	d.		£	s.	d.
House	500	at	1	0	..	0	5	0
Contents	500	at	1	0	..	0	5	0
Duty on	1000	at	3	0	..	1	10	0
						£2	0	0

An increase of *four shillings* on the present insurance, brought about by—a reduction of premium!

Mr. Barnes winds up his extraordinary Report by asking the question I have often addressed to others, when in conversation professionally and otherwise, for the last twenty-five years—"*When did you* LAST *see a dwelling-house on fire?*" I reply—Jan. 13th. at Holloway (when the private dwelling of W. Prentice, Esq., was destroyed by fire); and having thus answered Mr. Barnes' notable question, I take leave of his Report.

The number of fires in the list of "totally destroyed" during the past year, shows an increase of 12 above those of 1853, and an increase of 6 or 7 on the average of the 21 years previous.

The writer in the *Quarterly Review* before quoted, observes, that a decrease in the number of "totally destroyed" is the "best test of the activity of the Brigade." Such, however, is by no means the fact, seeing that the circumstances of the case, in nine instances out of ten, are such as to be altogether beyond the control of the Brigade. Want of water (from frost, absence of water-mains, or neglect of turncock)—distance from the nearest engine station—delay in calling the firemen—small size or peculiar construction of the building, or inflammable nature of its contents—all contributed to swell the number of last years' "total losses."

In the list of "seriously damaged" will be found nearly all the largest fires of the year; and at them was the efficiency and activity of the Brigade most fully tested;—difficulties and disadvantages of no ordinary kind being frequently encountered and triumphantly surmounted. In upwards of thirty instances the premises were *all but destroyed.* Want of space prevents even enumerating the occasions upon which the exertions of the firemen have been conspicuously successful. I may, however, just mention the following as a few of the most striking:—January 5th, 6¾ A.M., Bennett's-hill, Doctor's-commons, the premises of Mr. Coombs, carpenter and builder, and Messrs. Hodgkinson, envelope-makers. February 16th, 11¾ P.M., London-wall, the workshops of Mr. Perry, cabinet-maker and upholsterer. February 28th, 2 A.M., Holland-street, Bankside, the glassworks of Messrs. Pellatt and Co. March 9th, 10½ P.M., Wellington-street, *Strand, the papier-maché* manufactory of Mr. Bielefield.* June 21st, 3¼ A.M., New-road, St. George's East, the oil warehouse and colour-works of Messrs. Pinchin and Johnson. July 29th, 8¼ P.M., Wood-street, Cheapside, the premises of Mr. Jones, carpenter and packing-case maker. August 10th, 7¼ A.M., Old Fish-street, the premises of Mr. Fitch, manufacturing stationer. August 16th, 11¼ P.M., Thames-bank, Pimlico, the extensive premises of Messrs. Cubitt and Co., builders. August 30th, 5 A.M., Lower Thames-street, the warehouse of Messrs. Baiss Brothers, wholesale druggists, the same premises having been previously destroyed by fire in October, 1849. September 16th, 8¼ P.M., Pump-row, Old-street-road, the premises of Mr. Hooker, engineer, and M. Camphigne, pianoforte-maker—an incendiary fire. September 23rd, 8¼ P.M., Shad Thames, Messrs. Laing and Shand, sail-makers. December 3rd, 6¼ A.M., Arundel-street, Strand, the Whittington Club-house, formerly the well-known *Crown and Anchor* Tavern.

Upon each of these, as upon other occasions, an immense body of fire was made to succumb to the powerful exertions of the Fire Brigade, under the skilful direction of Mr. Braidwood, aided by the district foremen, Messrs. Fogo, Colf, Staples, and Henderson, in conjunction with the *West of England* firemen under Mr. Connorton.

At many of last year's fires, the exertions of parish-engine keepers justified the good opinion of Mr. Braidwood, hereinbefore narrated. The writer in the *Quarterly Review* says, with reference to parish engines, "The majority of these are very inefficient, not having any persons appointed to work them who possess a competent knowledge of the service. Even women used, now and then, to fill the arduous post of director; and it is not long since a certain Mrs. Smith, a widow,† might be seen at conflagrations, hurrying about in her pattens, directing the firemen of her engine, which belonged to the united parishes of St. Michael Royal and St. Martin Vintry, in the City. We question, indeed, if, at the present moment, any of the parish engines are much better officered than in the days of Widow Smith, with the exception of those of Hackney, Whitechapel, Islington, and perhaps two or three others." The first named parish have recently established their engines upon a most liberal footing, and the inhabitants are justified in expecting corresponding usefulness. Wherever parish engines are inefficiently worked, it almost invariably arises from the niggardly spirit that withholds the funds, which in this, as in all other cases, are "the sinews of war."

* Notice in vol. 60, page 299.

† Notice at vol. 29, page 4, *Mech. Mag.*

Mr. James, superintendent of the Leeds Fire Brigade, as also Mr. Superintendent White, at Gravesend, have made several very successful applications of the *fire-annihilator*, showing that when skilfully applied to a legitimate case, the apparatus is not so utterly valueless as it had appeared from the improper uses to which it had been applied, and the exaggerations and misrepresentations by which its pretensions had been supported. Mr. Barnum, in his recently-published life, after alluding to the unfair interference with Mr. Phillips, and the determined opposition to his experimental demonstration, very justly remarks that, "When a fire has broken out, and is raging furiously, especially if the wind is blowing, the annihilator cannot be used to advantage, and in that respect I was *deceived* by the representations of the man who first called upon me. My experiences in life have convinced me that real merit does not always succeed so well as 'humbug;' and I consider Phillips' fire-annihilator a fair exemplification of the fact." It would seem as if Mr. Phillips was of precisely the same opinion, and not satisfied with the slow success that waits on modest merit, attempted "humbug," and between the two stools came to the ground. Mr. Curtis, Secretary to the Fire-annihilator Company, has recently applied to the Town Council of Liverpool for a reconsideration of the practical merits of the Fire-annihilator, upon the ground that the experiments made therewith in Liverpool were most unfairly conducted, and the reports thereon falsified. The editor of the *Liverpool Journal* observes that, "Questions of the greatest public utility are prone to lose themselves in party and personal enmities. This is the case of the fire-annihilator. The Company say it will extinguish fires; several councillors and the agent say, that every member in the Council would say so, had not the superintendent of the fire-police reported falsely against it. This is a grave charge, and, we believe, unfounded; but what does the Watch Committee do? They lend support to the accusation by gathering legal difficulties around their servant, and, like pettifogging lawyers, fencing themselves within technicalities. This is not the way a great Corporation should act, in reference to an important public matter."

13, Angell-terrace, Islington,
Jan. 27, 1855.

ON THE FLOW OF WATER THROUGH PIPES AND ORIFICES.

A paper on the above subject was read at the Institution of Civil Engineers, on the evening of February 6, by Mr. J. Leslie, M. Inst. C. E.

The author having been professionally called upon to report on a small scheme of water supply, in which it was proposed to lay down a pipe with unusually small declivity, was induced to have a set of experiments made on the discharge of a new lead pipe, of $2\frac{1}{4}$ inches diameter, and 1,086 feet in length, with heads varying from $\frac{3}{16}$ths of an inch to 10 feet. This pipe was laid in a coil of about 70 feet in diameter, and was afterwards successively shortened into lengths of 540 feet, 270 feet, 100 feet, 25 feet, and 10 feet. Other experiments were also made with pipes of $1\frac{1}{4}$ inch, and $1\frac{1}{2}$ inch diameter.

As much care as possible was taken to insure the escape of air; but the results were in some cases so anomalous as to induce the belief that complete success had not, in this respect, been always obtained.

The pipes were also carefully joined and soldered, and it was believed that, with one trivial exception, no internal obstruction had existed.

The observations, which were exceedingly numerous, were stated to have been made with much care, by Mr. John Lamond, an assistant of the author; and these had been tabulated at great length, and were annexed to the paper.

The object of the author having been to institute a comparison between the deductions of hydraulicians, and the results of direct experiment, he had adopted, as a standard of comparison, a formula which he believed to be due to Du Buat, and from that had calculated "the ratio of actual discharge to Du Buat's formula."

The formula employed was thus expressed:

$$v = \frac{3000\sqrt{d}}{\sqrt{\frac{l}{h}}}$$

in which v was the velocity per minute, l the length of the pipe, increased by 50 diameters, and d the diameter of the pipe, all in feet.

For the discharge (D), in cubic feet per minute, this formula became

$$D = \frac{2356 \cdot 2\, d^{\frac{5}{2}}}{\sqrt{\frac{l}{h}}}$$

Adopting this formula, the following were a few of the results obtained from the pipe 2¼ inches diameter:

Pipes 2¼ inches diameter 1,086 long +50 diameters=1,096 feet.

Head.		Gradient.	Observed Discharge, cubic feet per minute.	Ratio of actual discharge to Du Buat's formula.
Ft.	In.			
0	0$\frac{5}{16}$	1 in 70,256	·0444	·252
0	1	,, 13,152	·2048	·503
0	1¾	,, 7,515	·241	·448
0	2⅛	,, 5,260	·4412	·684
0	5⅛	,, 2,391	·7407	·776
1	5⅝	,, 757	1·4634	·863
2	9⅞	,, 394	2·22	·945
4	9⅛	,, 230	3·	·975
7	0⅛	,, 156	3 53	·945
9	11⅞	,, 109	4·286	·961

(It was shown in the discussion, which was only commenced, that the formula relied upon by the author was not that of Du Buat, which when applied gave results more closely approximating to those of the experiments, than were obtained by the formula employed in the construction of this table.)

Numerous experiments were also made on simple orifices—on short tubes placed sometimes vertically, and sometimes horizontally—and on vertical pipes, from which coefficients of discharge, greatly at variance with accepted data, had been deduced; but it was afterwards discovered that the apparent anomaly disappeared, if the active head were measured by the difference of level between the surface of the water in the cistern and the point of exit from the pipe, or the difference of level of the water in the upper and the lower cisterns.

Observations on a large scale were also made on the pipes of the Edinburgh Water Company. The "Crawley pipe" was 15 inches in diameter, and 44,400 feet long, with a differential head of 226 feet. The actual discharge was 255 cubic feet per minute, whereas, by the formula, it ought to have been 294 cubic feet per minute. This pipe was, however, thirty years old, and was known to be considerably reduced in diameter by incrustation.

The "Collinton pipe" was 16 inches diameter, 29,580 feet long, with a differential head of 420 feet. The mean of 15 observations gave an actual discharge of 571 cubic feet per minute, whereas the formula required that the discharge should have been 575 cubic feet per minute. This pipe was *only eight* or nine years old.

A section of the same pipe, of 25,765 feet in length, with a differential head of 230 feet, yielded, on a mean of 26 observations, 440 cubic feet per minute; whereas the discharge by the formula should have been 457 cubic feet per minute.

Another section of the same pipe, 3,815 feet in length, with a differential head of 184 feet, yielded 1,215 feet per minute, instead of 1,063 expected from the formula.

But a new iron pipe of 2¼ inches diameter, and 1,150 feet long, with about 11 feet of fall, yielded about what was due by formula to a pipe of 2½ inches diameter.

Observations were also made on the Dundee Conduit, which was 2 feet broad, with rectangular sides and a bottom of smooth stone slabs, with the following results:

FALL 1 IN 1,000.

Depth.	Calculated discharge	Actual discharge.	Actual average ascertained velocity.	Velocity by floats at surface.
Inches.	Cubic ft.	Cub. ft.	Cub. ft.	Cub.f.
6	109·	110·09	110·09	128·5
7	134·	134·83	116·	129·7
8	160·	162·16	121·6	133·1
9	186·	184·61	123·	136·7
10	213·	214·28	128·6	138·1
11	240·3	240·	131·	140·
12	268·	266·6	133·3	146·7

The formula used in this instance might be thus expressed:

$\frac{15}{16}\sqrt{\text{hyd. mean depth}\times\text{fall in feet per mile}}$ =velocity in miles per hour.

The discharges by the sluices of the dock gates of Dundee and the lock gates of the Monkland Canal were also ascertained and tabulated. (The mean of the first seven observations gave a coefficient for feet of 5·3, and of the next four observations, omitting one imperfect observation, of 5·25, which were consistent with the received formula.)

A few experiments were also undertaken with respect to the flow of water over notch-boards; and some investigations were made for the purpose of determining whether the theoretical addition of 50 diameters to the length of the pipe was practically correct.

The author's conclusions were, that while Du Buat's formula gave very accurate results at moderate rates of inclination, it gave a great deal more than the actual discharge with very low gradients, and very considerably less with steep gradients.

PORTER'S PATENT ANCHORS.

BEFORE THE JUDICIAL COMMITTEE OF THE PRIVY COUNCIL.

Friday, Feb. 2, *and Saturday, Feb.* 10, 1855.

Present.—Lord Chief Justice Jervis, Sir Edward Ryan, Sir John Dodson, and Mr. Pemberton Leigh.

This was an application of a peculiar character for the confirmation of a patent, originally granted in 1838, for an improvement in the construction of anchors.

Sir F. Thesiger, with Mr. Webster, appeared for the applicant, and Mr. M. Chambers, with Mr. Serjeant Atkinson and Mr. Russell, opposed the application.

Mr. Pemberton Leigh delivered the judgment of their Lordships. The following is a condensed report of his remarks:—The patent, he said, was granted on the 15th of August, 1838, to Mr. Porter, for an improvement in the manufacture of anchors, and expired on the 15th of August, 1852. On the 18th of February, 1853, Her Majesty granted a further term of six years for the exclusive use of the invention. The term was granted by new letters patent, which contained a condition similar to that in the original patent, that the grant was to be void if it should appear that the invention was not new as to the public use and exercise thereof in England, or not invented and found out by Mr. Porter. In an action brought against Mr. Bloomer for the infringement of the patent, it was proved that this was not a new invention within the condition of the letters patent, and it was agreed on all hands that the patent at present was void. The Legislature, however, had thought fit to vest in the Crown, under certain circumstances, on the recommendation of the Judicial Committee, the power of restoring and giving effect to the grant so become void, and upon a petition being presented, it had been referred to their Lordships to inquire whether it was fit that the application should be granted. The power was conferred upon the Crown by the 5th and 6th William IV., chap. 83, sec. 2, and it had been admitted, that even if the petitioner brought himself within the provisions of the Act, it was still left to the discretion of the Judicial Committee to recommend or not the confirmation of the patent, as justice to all parties might appear to them to require. There were, therefore, two questions before their Lordships: first, whether the petitioner had proved those facts which were necessary in order to enable the committee to recommend a confirmation; secondly, whether the circumstances were such as to make it fit that their Lordships should exercise their discretion by recommending a confirmation if they had the power so to do. It was objected by the opponents of the petition that those questions did not arise in this case, because the provisions for confirmation of a patent did not apply to a patent for an extended term. But the grant of an extended term was a new grant by new letters patent, subject to the same conditions, open to the same objections, and, in ordinary cases at least, entitled to the same advantages as the original grant. In the case of "Aube's patent" it was decided that the grant of an extended term must be considered as a new grant. There appeared to be nothing in the nature of the benefit now sought which should exclude its application to a patent for an extended term; the question therefore arose, whether the petitioner had established those facts which were necessary, in order to give jurisdiction to the committee. The onus of proof lay on the petitioner, and he must satisfy the committee, first, that before the date of the original patent the invention was not publicly and generally used; and secondly, that the grantee of the original patent believed himself to be the first original inventor. It was proved by the evidence, that Mr. Porter was, in no sense of the term, the first inventor of this improvement. The principle had been discovered and put in use by Mr. James Logan, of Liverpool, more than ten years before the date of Porter's patent; he had made drawings of his invention, which he had shown to a great number of persons, and had procured models of it to be made, which he had sent to anchorsmiths and other persons likely to bring the invention into use, and had caused one of those models to be hung up in the room of the underwriters at Liverpool, where it remained for twelve or fifteen years, and was probably there when Mr. Porter took out his patent. It further appeared that he had actually, in 1826, manufactured a large anchor upon this principle, and had sold it in that or the following year; that it was put on board a steamer called the *William Huskisson*, and remained there in use till 1836, when, one of the toggles having been broken, it was sent to the yard of Messrs. Logan, as one of the witnesses said, to be repaired, and from that time it lay in the yard open to the inspection of all the workmen who were employed there, amounting, as was said, to about 250, and of all persons whom business or other circumstances might bring to Messrs. Logan's works. If their Lordships could rely with confidence on the accuracy of Mr. James Logan's memory, the case would be carried much further with respect to the use of the invention. It was not easy to define what was the exact

meaning of the expressions "publicly and generally used," contained in the section of the act of Parliament referred to. Their Lordships could not consider the use of the invention on board a single ship, however public, or for whatever length of time, as a general user. They were satisfied that the invention had not been publicly used at the date of the original letters patent. Whether the petitioner had made out the second point, namely, that the original patentee believed himself to be the first and original inventor, depended entirely upon the period at which the belief must be proved to have existed. There was no reason to doubt that he so believed himself when the original letters patent were granted; on the other hand, it was plain that he could entertain no such belief at the time when the renewed grant was made. According to the doctrine laid down by Lord Lyndhurst in "Westrop and Gibbons's patent" (Webster's Cases, 555), a party could not be permitted to shelter himself under wilful ignorance, but must be fixed with knowledge, not only of what he did know, but of that which he would have known if he had made the inquiries which it was incumbent upon him to make. It had been argued, however, very forcibly, that the belief of the original patentee must mean a belief at the time when the original patent was taken out, and that neither the merit of the original patentee, nor the rights of the assignee could be affected by circumstances which came to the knowledge of the former only after the patent had been granted, and when, possibly, as in this case, all his interests in it had ceased. It was impossible to deny that there was great weight in that argument; but, on the other hand, it must be remembered that it was the new patent which it was sought to confirm; that it was as a new and an original patent that it was brought within the meaning of the clause, and that there was nothing unreasonable, when it claimed the same advantages, in subjecting it to the same restrictions as an original grant. Whatever doubts their Lordships might entertain upon other points in this case, upon that which was sufficient for its decision, namely, the mode in which they were to exercise their discretion, if the circumstances gave occasion for it, they could entertain no doubt whatever. The power given to the Crown was to provide an extraordinary remedy for extraordinary cases, to supersede the ordinary rules of law at the expense of the public in favour of an individual, to give force and validity by a *quasi* legislative authority to a grant of monopoly actually void, and to exclude from the use of the invention not only the other subjects of Her Majesty in England, but even the first and original inventor who had actually brought it into public, though not into general use before the first patent was taken out. That that was the effect of a confirmation was perfectly clear, though it appeared from Lord Lyndhurst's observations in "Westrop and Gibbons's case" that such was not the intention of the framer of the Act, nor its effect as it was originally introduced into, and as it left, the House of Lords. To what extent, under the language of the Act, other objections to the validity of the patent were removed by the confirmation might be doubtful. In the case of "Card's patent" (6 Moore 7, c. 213), Lord Campbell suggested that the generality of the expression was probably intended to be limited to prior use of the invention. His Lordship also intimated that the provisions of the clause were meant to be confined to cases where either doubts might exist whether there had been such a prior use as to vitiate the patent, or where the use of the invention, after some fruitless trials, had been thrown aside and abandoned by the original inventor. In this particular case there was no room for doubt that, if the facts which actually existed had been known at the time when the original patent was taken out, no patent ought ever to have been granted to Mr. Porter. If the facts now in proof had been known to their Lordships when they recommended an extension of the patent, they never could have given any such recommendation to the Crown. Their Lordships had considered what ought to be done with respect to the costs of the opponents. It was of great importance that parties should not be discouraged from bringing important facts to the knowledge of the Court by the fear of the costs which they might have to pay if their opposition was successful, and upon that ground, in "Westrop and Gibbons," the parties opposing were allowed their costs. But their Lordships were not satisfied with the manner in which this opposition had been conducted. Much expense had been occasioned by relying upon patents for inventions which had really no resemblance to this, and witnesses had been produced to whose testimony their Lordships could not give the smallest credit. On the whole, their Lordships would humbly advise Her Majesty that the application ought not to be granted, but that no costs should be awarded to the opponents.

CLARK'S PATENT FOR PURIFYING WATER.

(Before the Committee named in the preceding Case.)

Saturday, February 10, 1855.

This was an application for the extension of a patent granted on the 5th of March, 1841. The object of the patent was to soften and purify water, for domestic and manufacturing purposes, more especially in chalk districts. By the employment of various tests the quality of the water was ascertained, and by the introduction of lime it was divested of chalky and organic matters, one result of which would be a great saving in soap. It was stated that the patentee had sustained a loss in endeavouring to bring the process into general use of about £1,000. The patent is now in operation at the Plumstead Water-works, and it was alleged that as new companies are formed, there was every reason to believe that they would avail themseves of its advantages. The plan was highly approved by the Board of Health. Several witnesses deposed to its excellency, and, among them, professors Miller and Hoffman. The extension was opposed by M. Lelong-Burnet, of France.

Mr. Graves and Mr. Aston appeared for the petitioner; Mr. Hindmarch for the opponent.

Lord Chief Justice Jervis said, their Lordships would humbly advise Her Majesty to grant an extension for seven years.

ON THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

Sir,—A few (and very few) words seem to be called for in reply to the last communication of Mr. Recordon with respect to the moon's motion.

I must first of all profess myself unable to penetrate the mist which veils his true meaning from the apprehension of the vulgar. As far, however, as I can understand him, nothing seems to me more vague and unsatisfactory than his whole train of reasoning. In order that I might do him no injustice, I took the trouble of *painfully* reading through his former letter. And I must confess that the ambiguity with which he has succeeded in enveloping his meaning is most ingenious and successful. I do not know whether any other of your readers has taken the trouble to endeavour to comprehend him; but I for one must own, that I cannot, for the life of me, understand either from his former communication, or what he has lately added to it, what he wishes to convey by the statement, that the "Moon and the Earth stand in the same dynamical relation to each other."

If he means to imply by this, that the moon's attraction on the earth is of the same intensity as that of the earth on the moon, he is clearly in error; for that would require that the quantities of matter in the two bodies are equal, which they are not.

Again, if he means that supposing the moon to be absolutely at rest, the earth would revolve about the moon in exactly the same way as the moon does actually about the earth, (and this, I confess, seems to be what he really wishes to convey, when he says, page 82, "if we consider the moon to be at rest while the earth rotates uniformly on its axis, perpendicularly projected at A, so that one of its points, B, describes a whole circumference in the same time as C did in the former motion, but in the contrary direction,") all that I can say is, that supposing the moon to stand still, the apparent motion of the earth round her is not correctly described in the words quoted. The rotation of the earth round her axis once in 24 hours would soon remove the point, B, from the line joining the two centres; and in the time that C (in the moon) is making a complete circuit, B would have made no less than 27 complete revolutions round the earth's axis, and have arrived at, and left the position indicated, no less than 27 times.

Moreover, supposing Q (fig. 3, page 83) to be the point through which the mean attraction of the earth or the moon passes, that point is not *a fixed point* in the moon, as Mr. Recordon's subsequent reasoning seems to imply, but variable in such a manner that however the moon be supposed to revolve about her own axis, it must lie in the line joining the centres of the earth and moon. In fact, supposing the moon a homogeneous sphere, the earth's attraction, as appears from this very fact, can exert no influence on the moon's rotation.

It is, however, now time to examine the new matter Mr. Recordon has brought forward. He tells us we must consider "the moon as it is in reality, viz., as an imperfect heterogeneous sphere (not even composed of homogeneous concentric shells.)" We should like to know whence Mr. Recordon derives his intimate acquaintance with the interior construction of the moon. Of that of the earth, which lies so much more under our control, we know little enough; but who taught any sublunary being anything of the law which regulates the distribution of matter within the moon? We presume that Mr. Recordon has received a visit, for this very purpose, from the far-famed

"man-in-the-moon." He then informs us, that the free rotation of the moon about her axis is, in such a case, impossible, though on what grounds, it is very difficult to understand; and sums up with these remarkable words, which seem to furnish him a clue to escape from every difficulty, and would evidently be a satisfactory mode of accounting for any and every kind of motion conceivable or inconceivable. "*Applying our principle*, we conclude now, also, that the real moon can only revolve round the earth's centre, as if it were rigidly connected with that point." To this solemn dictum, we, who unfortunately know no principles but those of mechanics, can only reiterate the question, What principle, and how applied?

Mr. Recordon's explanation of his principle is one of the most edifying instances of mystification that I ever had the luck to encounter.

Supposing the moon at rest, he refers the earth to three co-ordinate axes, that of y being her axis, that of z the line joining her centre with that of the moon, and that of x the straight line through the earth's centre in the plane of the moon's orbit perpendicular to the axis of z. He now supposes another movable system of co-ordinates produced by the modest change of $+x$ into $-x$. We are then told that hereby "one and the same dynamical phenomenon has occurred in two different systems of co-ordinates," whence "the meaning of saying that from different causes, bodies have the same dynamical relation, *must be quite clear*." He might just as well have told us, that because there are fishes innumerable in the sea, therefore we are enjoying a good dinner!

But we have not yet done with the consequences of this modest change of $+x$ into $-x$. Behold

"What great events from little causes spring!"

The great magician flourishes his wand; $+x$ is changed into $-x$; and hey! presto!

"Taking, now, the first system of co-ordinates again, we see that the transmitting of the said dynamical phenomenon to the new system has produced the following effects:—*Firstly*, to bring the earth to rest: *secondly*, to produce the often-defined motion of the moon; *thirdly*, to engender a new centripetal force, equal in intensity and coinciding in direction with C G. This new force being equal and directly opposite to the *still subsisting force* C E, we may, according to D'Alembert's principle, take them both away. And now, the already-described motion of the moon exists under the influence of the unaltered attraction, C G, from the earth, in *confirmation of our principle*."

Oh! rare co-ordinates! Mr. Recordon has at last discovered the true philosopher's stone. Change $+x$ into $-x$, and you can at once bring the earth to rest, engender a new centripetal force, and produce I know not how many magical effects.

Here, then, you blunder-headed mathematicians, who have been content so long with using co-ordinate axes simply to "*fix space*," and reduce to calculation the results of dynamical causes previously existing, under the false impression that they could do nothing more for you, here is a grand discovery! Change $+x$ into $-x$, and you may engender new forces; and so bring the most obstinate problems, the most recalcitrant cases of motion to reason.

Seriously, however, is Mr. Recordon aware that the earth is under precisely similar conditions, with respect to forces of attraction, as the moon? The sun attracts equally the two bodies, and the moon's attraction on the earth is of the same kind as that of the earth on the moon, though less intense. Moreover, we know the earth to be a heterogeneous body, whose layers of equal density follow a most complicated law. "According to our principle," then, the earth ought to revolve about her axis *once a month*. Aye, but here's the rub, she really rotates once in twenty-four hours. How will "our principle" account for this?

The difficulty may be great, but it is not insuperable:—for, has not Mr. Recordon a system of co-ordinates? Who knows, if the change of $+x$ into $-x$ do not succeed this time, that a further change of $+y$ into $-y$ may do the trick to admiration?

I suppose I ought to say one word with regard to the foot-note to Mr. Recordon's last letter, which seems a kind of indirect reply to my former strictures on his use of the term centre of gravity.

I grant at once that Daniel Bernouilli's is a great name, and his authority on most mathematical questions of the highest grade; but I must except his strictures on Sir Isaac Newton's lunar theory. Like most mathematicians of that time, he had to *learn* the very alphabet of physical astronomy from that great master, and that in spite of his long-cherished prejudices. As a matter of fact we know it was long before Newton's doctrines found anything like a general acceptance on the continent. Bernouilli, in the passage quoted by Mr. Recordon, evidently entirely misconceived the term centre of gravity as applied to the moon. He imagined that it was the point of action of the forces of attraction to the earth's centre; whereas, in truth, the moon's centre of gravity has no more to do with the earth's

attraction than the earth has to do with the moon's attraction. According to the Newtonian law of universal gravitation, every particle of matter in the moon is attracted by every other particle of matter in the moon; and the moon's centre of gravity is relative to these forces of attraction, and would be the same if the sun and earth were both suddenly annihilated, and she went rolling on into space with the velocity she now has. It is about axes passing through this point that the moon would rotate freely, had a motion of rotation been impressed upon her, quite independently of any forces of attraction whose resultant passes through this point. D. Bernouilli, to whom this notion was new, may well be excused for the misapprehension he has fallen into; but at this time of day, when the doctrine of Newton has received so much elucidation, and is explained with so much of minuteness and exactness, it is quite a different matter; and I am quite sure that D. Bernouilli himself would be the first to recall the unfortunate paragraph which has so much misled Mr. Recordon.

I am, Sir, yours, &c.,

INDAGATOR.

London, Feb. 13, 1855.

ON THE INDICATED HORSE-POWER OF STEAM ENGINES.

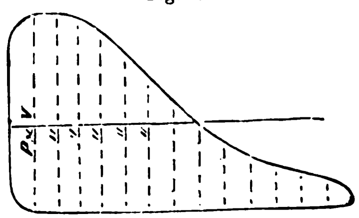
To the Editor of the Mechanics' Magazine.

SIR,—Permit me to call your attention, and that of your readers, to a very singular error that exists in the present method of "indicating" steam engines, or rather in the calculation of the horse-power from diagrams obtained by a McNaught's indicator. In the present system of calculation, an average is taken by *equidistant* ordinates of the pressure upon the piston, and this average pressure is multiplied by the *average velocity* of the piston to get the power.

Now, in proving that this method of calculation is essentially wrong, we shall simply require, as an axiom, that pressure multiplied by velocity gives power, and only when multiplied by velocity.

Since we only know by the indicator the pressure upon the piston of an engine, and not that upon the crank-pin, except indirectly, we will confine ourselves, for the sake of simplicity, to the piston end of the beam. Everybody knows that the piston of a steam engine works with a varying velocity. It starts from a state of rest when the crank is on the "dead centre," and reaches, with a constantly-accelerating motion, the middle of the stroke, thence gradually decreasing in velocity until the crank reaches the opposite centre. Now it is evident that the piston does not transmit the same power when starting from a state of rest and moving very slowly at the commencement of the stroke, that it does when going with its greatest velocity in the middle of the stroke. When the indicator diagram is divided by *equidistant* ordinates, the manner of calculating ought, therefore, to be as under:

Fig. 1.

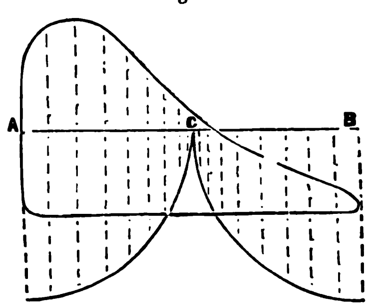


The sum total of the products P×V (pressure multiplied by velocity) divided by their number will give the *average power* per square inch during the stroke; but as the velocity is constantly varying, an infinite number of ordinates would be required to ensure strict accuracy.

To calculate diagrams in the above manner would be a very tedious process. The following is my method; it is as simple as that now in use, and it appears to me to be perfectly correct:

With A and B, fig. 2, as centres, and half the atmospheric line (A B) as a radius,

Fig. 2.

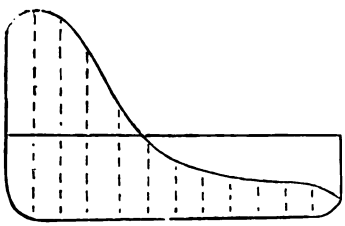


describe two quadrants of circles cutting the atmospheric line in C. Divide the two quadrants into the desired number of equal parts, and from the points so obtained project perpendicular straight lines dividing the figure. We thus get a number of ordinates exactly proportioned to the velocities of the different parts of the stroke.

I am sure that no one, after a moment's reflection, would say that the power of two

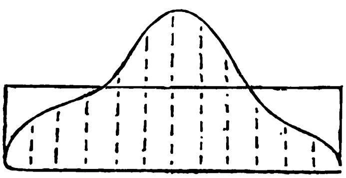
engines from which the two following diagrams, fig. 3 and fig. 4, may be supposed to have been taken respectively, would be

Fig. 3.



equal, though it is made to be so by the usual mode of calculation, supposing the

Fig. 4.



ordinates of fig. 3 to be 32, 30, 18, 13·5, 12, 11, 9, 8, 6, 5, 3·5, and 3 respectively; and those of fig. 4 to be 5, 8, 9, 10, 20, 25, 23, 18, 12, 10, 6 and 5, the average in each case being $\frac{151}{12} = 12{\cdot}6$.

But if the two figures above be divided by lines projected from two quadrants of circles as before shown, the respective results will be found to vary considerably, which they do for the very obvious reason, that the high pressure at the commencement of the stroke in the one figure, gives a comparatively small amount of power, on account of the slowness of the piston motion; whilst in the other, the *same* average amount of pressure is obtained on the piston, but the steam is used very *much more rapidly in the middle of the stroke*.

I may remark, in conclusion, that the above is no doubt the cause of a part of the discrepancy that is found to exist between the actual and indicated horse power of engines working expansively. I should be much obliged if you, or some of your talented correspondents, would further elucidate the subject.

I am, Sir, &c.,

INGÉNIEUR.

Manchester, Feb. 3, 1855.

PARKER'S SMOKE-CONSUMING APPARATUS.

To the Editor of the Mechanics' Magazine.

SIR,—I must crave permission to reply to the remarks of Mr. Williams, at page 108 of your last number, who in his anxiety to remove some "misapprehensions" on my part, has fallen into very serious error himself. I am much obliged to Mr. Williams for the copy of his very interesting treatise on "The Combustion of Coal and the Prevention of Smoke;" although a careful perusal and vivid recollection of Mr. Williams's numerous contributions to your pages had long since put me in possession of most of the information therein contained; and I was not a little surprised at Mr. Williams's quarrelling with my statement, "that the principle of air-distributors had originated with Mr. Argand." Strictly speaking, this is not quite so; but then Mr. Williams has laboured so long and so zealously to establish the perfect identity of principle between "Argand burners," applied in lamps, and "air-distributors," applied to furnaces, that I confess I had become thoroughly inoculated with his former view of the case. At page 34 of his book, Mr. Williams says, "observing the means by which the gas is effectually consumed in the ARGAND LAMP, it seemed manifest that, if the gas in the furnace could be presented, by means of *jets*, to an adequate quantity of air, as it is in the lamp, the result would be the same. The difficulty of effecting a similar distribution of the gas in the furnace, by means of jets, however, seemed insurmountable: one alternative alone remained, namely, that, since the gas could not be introduced by jets into the body of air, *the air might be introduced by jets into the body of gas*." And Mr. Williams quotes Professor Brande, to support the identity of the two operations—only reversed, or inverted. At page 108 of your last number, Mr. Williams quotes the Professor's words, apparently to uphold a somewhat different opinion. On the same page, Mr. Williams says, "Again; I did not give the name of *Argand* to my mode of introducing the air. That name was given, and by another, many years, I believe, after the patent was sealed in 1839. In truth, the word *Argand* does not appear in my patent or *specification*, and has only been used by me in illustration of the effect produced."

Now this statement is so extraordinary, that I cannot allow it to pass uncontradicted. At page 94 of Mr. Williams's book, he gives an engraving and description of "one of the modes first adopted, under *the patent for the* ARGAND *furnace* of 1839!"

At page 89, Mr. Williams quotes, approvingly, an extract from Dr. Ure,* who actually tells us, that "One of the many ingenious methods in which Mr. Williams has carried out the principles of what HE *justly calls the* ARGAND *furnace*, is represented at fig. 1310"!! In the 37th vol. of the *Mech. Mag.*, Mr. Williams published a description of the specification of his patent, and at page 596, writes as follows:—"The specification also states that this operation is intended 'for the same purpose, as air is admitted into the centre of the body of gas issuing from an *Argand* gas-burner;' and hence a furnace so supplied with air has been called an ARGAND FURNACE"!!!

Why Mr. Williams is *now* so desirous of ignoring the name of *Argand*, after so long and extensive use thereof, I cannot imagine. "What's in a name?"

Although it may be justly conceded to Mr. Williams that he was the first person who developed the true principles of combustion in furnaces, and who made a rational application of air-distributors for the prevention of smoke, yet it cannot be admitted that the *modes* employed by him are the *only ones* by which that principle can be made available.

The real question now at issue, raised by Mr. Williams himself, is this: Had Mr. Williams, prior to the date of Mr. Parker's patent, applied an air-distributor to furnaces for the prevention of smoke, *constructed and placed* like Mr. Parker's? Mr. Williams endeavours to establish an affirmative, by referring to page 92 of his work; but I am quite sure that Mr. Parker would not consider the use of such an air-distributor, so placed in the furnace, any infringement of his patent.

The apparatus referred to by Mr. Williams was only the subject of *experiment* in a tubular boiler, four feet long, and is not represented as having ever been actually employed to any extent.

The principle of air-distributors, so advantageously applied in several ways (or modes) by Mr. Williams, is somewhat differently applied by Mr. Parker, whose *mode* of application consisted in making the Argand air-distributor separate from, and independent of, the furnace; a *mode* which, if effectual, in practice (and that it is so, is matter of daily demonstration), unquestionably is the *simplest* and *best* hitherto devised.

I hope to be ever ready to render unto Cæsar the things that are Cæsar's; but then Cæsar must not want, *also*, that which belongs to—somebody else.

I am, Sir, yours, &c.,
WILLIAM BADDELEY.

13, Angell-terrace, Islington, Feb. 7, 1855.

* "Dictionary of Arts."

COLOURED FLUIDS.

To the Editor of the Mechanics' Magazine.

SIR,—It would be a great favour to me if any one of your numerous readers who are well informed on chemical subjects, would tell me how to make a fluid or fluids that should, while liquid, be of any given colour, such as crimson, blue, yellow, green, &c., &c., but which, when spread out thinly on any white surface, such as linen or paper, and exposed to the action of the atmosphere, would turn gradually very dark, or quite black.

I am, Sir, yours, &c.,
NICHOLAS BROWNTON.

Oldchurch Side, Feb. 12, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

HACKETT, JOHN, of Derby, manufacturer. *Covering India-rubber thread, whether vulcanized or otherwise, with sewing-silk, and with other articles.* Patent dated July 20, 1854. (No. 1596.)

Claims.—1. Covering India-rubber thread, whether vulcanized or otherwise, with sewing-silk, mohair and silk, linen thread, or chenille. 2. The application of threads covered with either of the above substances to the manufacture of web.

*** The above Abstract should have appeared on page 139 of our last Number.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved construction of metallic spring.* (A communication.) Patent dated July 21, 1854. (No. 1602.)

This improved spring consists of a thin metallic strap and a rigid bar, connected together at each end, for the purpose of sustaining the weight of carriage bodies. The elastic force rendered available in this construction of spring is derived from the tendency of the thin metallic strap to retain its length, and thus resist the tensile strain put upon it by the load which it carries.

MOSS, JOHN THOMAS, of Arundel-street, Strand, Middlesex, hotel manager. *Improvements applicable to apparatus for roasting meat and other edible substances.* Patent dated July 21, 1854. (No. 1603.)

In this invention, a wheel or its mechanical equivalent, capable of being made more or less eccentric, is used in combination with cranked spear and other spits, for the purpose of securing their equilibrium or balance during their entire rotation whilst carrying joints; and the inventor employs dogs, whose prongs are capable of sliding laterally on thin standards or supports, and dogs with spring

arms, for the purpose of securing the joint to the spit.

KNIGHT, JOHN, of Birmingham, Warwick, gentleman, and JAMES STUBBS, of Oldbury, Worcester, mechanical engineer. *An improvement or improvements in the manufacture of bricks, tiles, and such other articles as are or may be made of clay, which improvement or improvements may also be applied to the manufacture of artificial fuel, and to other mixing and tempering processes.* Patent dated July 21, 1854. (No. 1604.)

The inventors introduce through the dies or moulding surfaces of the brick-making and similar machines, steam, which by condensing on the surfaces of the material used, and of the different parts of the interior of the machine, forms a layer or stratum of water between the two, and facilitates the motion of the piston and the moulding substance.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *An improvement in treating raw silk fabrics while being dressed and dyed.* (A communication from Messrs. C. Jandin and A. Duval, of Lyons, France.) Patent dated July 21, 1854. (No. 1608.)

This improvement consists in holding raw silk fabrics in a state of tension, both in length and breadth, while being dressed (or deprived of the gummy matter contained in them) and dyed.

SEDGWICK, JAMES, of Lewisham, Kent, master mariner. *Improvements in shipbuilding.* Patent dated July 21, 1854. (No. 1609.)

Claim.—Constructing vessels in such manner that that portion of every transverse vertical section which is adjacent to the keel shall be a convex curve.

HARRATT, CHARLES, of Royal Exchange-buildings, London. *Improvements in fastenings for ship-building.* Patent dated July 21, 1854. (No 1611.)

These improved fastenings, which are to be used instead of trenails and other fastenings now employed, are formed each of three or more parts, in such manner that these parts, being introduced into the hole formed to receive the fastening, are expanded by the introduction of an internal key.

FIRTH, THOMAS, machine-maker, of Huddersfield, and JOHN WILSON, finisher, of Mirfield, West Riding, York. *Improvements in finishing woollen, worsted, silk, and other woven fabrics, and in the apparatus employed therein.* Patent dated July 22, 1854. (No. 1614.)

This invention relates to what is generally called "pressing," and consists in heating the papers used in that process (as well as the metal plates), and placing them in or between the foldings of the fabric.

LOSH, WILLIAM SEPTIMUS, of Wreay Syke, Cumberland, gentleman. *Improvements in bleaching.* Patent dated July 22, 1854. (No. 1616.)

Claim.—The treatment of vegetable fibres preparatory to the bleaching thereof, by immersing them in a solution of any of the soluble combinations of sulphur with an earthy base, such as the bi-sulphuret of calcium or lime, alone or combined with the hyposulphite of the same base.

HUTCHINS, EDWARD FRANCIS, engineer, of Whitechapel-road, Middlesex. *Constructing the cylinders of engines worked by steam, air, or other fluid body in a circular form or plan, by which means more power is obtained from a given quantity of the said fluid body, in cases where circular motion is required, than by any other known form of cylinder.* Patent dated July 24, 1854. (No. 1620.)

The inventor constructs an engine with radial pistons, moving round between two concentric cylinders.

ROBERTS, RICHARD, of Manchester, engineer. *Improvements in machinery for punching, drilling, and riveting.* Patent dated July 24, 1854. (No. 1621.)

The objects of this invention are—1. To increase the efficiency of punching-machines by the direct application of the fly-wheel to the eccentric shaft, together with means for causing the fly-wheel to acquire momentum sufficient to do its work, without the intervention of heavy-toothed wheels. 2. To afford the operative a much larger proportion of the whole time occupied by each stroke of the machine than is allowed to him by the machines in use for adjusting the object to be operated upon under the tool, and so to enable him to run the machine at a higher speed, and consequently to turn off more work. 3. To obviate the necessity of raising the punch higher than is required for the adjustment of the work. 4. To adapt the punching-machine to perforate and rivet together plates in the sides of ships and other large works, whilst being suspended from a travelling-crane, &c., &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the preparation of silk.* (A communication.) Patent dated July 24, 1854. (No. 1622.)

Claims.—1. A certain described mode of warping silk directly from the cocoons. 2. A certain construction and arrangement of "heck," composed of two sliding bars, and guiding the threads in a vertical plane. 3. The warping of the silk threads either in gangs or half gangs, guided on to the warping mill in the form of bands or ribbons, each single thread being separate from the rest when wound on the warping mill. 4. The use of revolving vanes or blades, situ-

ated inside the warping mill, for the purpose of drying the silk threads, &c.

CASTETS, AUGUSTE, manufacturer, of Paris, France. *The extraction of a substance for supplying the place of quinine.* Patent dated July 24, 1854. (No. 1623.)

This invention consists in submitting the seeds of the plant called cumin to processes similar to those employed to obtain quinine from cinchona bark.

WILSON, GEORGE FERGUSSON, of Belmont, Vauxhall, managing director of Price's Patent Candle Company, and GEORGE PAYNE, of the same place. *Improvements in distilling fatty and oily matters.* Patent dated July 24, 1854. (No. 1624.)

This invention consists in distilling neutral or partially neutral fats and oils in an atmosphere of steam or vapour of water in such manner as to distil over glycerine, together with fat acids mixed, but not combined.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in kneading-machines.* (A communication.) Patent dated July 24, 1854. (No. 1625.)

This invention consists—1. In forming a kneading-machine consisting of a square or trapezoïdal box rotating about an axis; and 2. In directing a current of hot or cold air into the kneading-box by a fan or other suitable means.

PRESTON, FRANCIS, of Manchester, spindle and flyer-maker. *Certain improvements in machinery for preparing cotton and other fibrous materials.* Patent dated July 25, 1854. (No. 1627.)

This invention consists in an improved mode of constructing the pressers for roving frames and other similar machines, known as Seed's Patent Centrifugal Pressers; in making under the hook by which the presser is suspended, a shoulder, which comes in contact with the under side of the clip or bearing, to prevent the presser rising from its working position, &c.

CHAMPONNOIS, HUGUES, of Chaumont, civil engineer, and JEAN BAPTISTE BAVELIER, of Dijon, manufacturer. *Improvements in the manner of treating beet-root and all other sugary and feculent vegetables.* Patent dated July 25, 1854. (No. 1628.)

Claims.—1. A method of maceration or extracting the saccharine juices from vegetable matters containing sugar, by means of juices of the same nature which have been previously partially or deprived entirely of the sugar they originally contained. 2. A mode of utilizing the fermentative power of liquors in actual fermentation, as a means of producing fermentation in other suitable liquors.

GRUNDY, WILLIAM, of the firm of John and Edmund Grundy, of Bury, Lancaster, woollen manufacturer. *Certain improvements in the manufacture of drugget.* (A communication.) Patent dated July 25, 1854. (No. 1629.)

This invention consists in the use of a warp of cotton, flax, hemp, or other textile material or materials, so arranged as to form a ground or back for druggets, each warp-thread being so placed as to allow the upper woollen cloth or drugget to be milled as usual and to any extent required, and which extra warp shall be so woven in as to form a distinct cloth or "carpet back," when milled and finished.

HALLUM, EPHRAIM, of Chester, cotton-spinner. *Improvements in machines for preparing, spinning, and doubling cotton and other fibrous substances.* Patent dated July 25, 1854. (No. 1630.)

This invention relates to the machines known as slubbing and roving machines, hand and self-acting mules, throstles, and doubling frames, and consists in the application to them of such arrangements of mechanism as shall impart to their first-motion shafts, and thus to their spindles, a speed which shall vary in inverse proportion to the quantity of material built on the cop or bobbin.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improvement in the process of converting wood into paper.* (A communication.) Patent dated July 25, 1854. (No. 1631.)

Claims.—1. A process of reducing soft woods to pulp, and rendering them fit for the manufacture of paper, by clearing them of knots, cutting them into strips, and crushing them between rollers. 2. The employment of chloride of lime or chlorine, as a solvent for the gummy matter contained in woody fibre. 3. The employment of sal. soda, in connection with chloride of lime, for bleaching pulp made as above.

SPENCE, PETER, of Pendleton, Lancaster, manufacturing chemist. *Improvements in obtaining sulphur from iron pyrites and other substances containing sulphur, and in apparatus for effecting the same.* Patent dated July 25, 1854. (No. 1632.)

Claims.—1. "The production of sulphur, by causing the sulphurous acid gas obtained from pyrites and other matters containing sulphur by burning to be conveyed through or in contact with coke, charcoal, or other solid carbonaceous or deoxidizing matters kept at a red heat, but not subjected to combustion by the admission of air. 2. A peculiar apparatus by which the sulphurous acid gas is conveyed in a stoneware or other pipe or vessel containing charcoal, coke, or other carbonaceous or deoxidizing matters,

heated by the combustion of the substance from which the sulphureous acid gas is obtained."

BELL, THOMAS, of Don Alkali Works, South Shields, and HENRY SCHOLEFIELD, also of South Shields. *Improvements in the manufacture of borax.* Patent dated July 25, 1854. (No. 1633.)

Claim.—Treating the mineral borate of lime in such manner as to separate the lime and other matters therefrom, and combining the boracic acid of such mineral with soda.

GARLAND, WILLIAM STEPHENS, and JOSIAH GLASSON, both of Soho Foundry, Stafford, engineers and boiler-makers. *A means of consuming smoke in furnaces.* Patent dated July 25, 1854. (No. 1634.)

A full description of this invention will be given shortly.

HURD, JULIUS C., of Medway, Worcester, Massachusetts, United States. *An improved machine and process for picking, burring, and cleaning cotton, wool, and for tearing up and reducing old fabrics to be re-spun.* Patent dated July 25, 1854. (No. 1635.)

Claims—1. The use of a combing in which the teeth are so curved as to bring the beater very near to the feed-rollers, and united with each other at their bases in the manner of saw-teeth. 2. A method of applying springs to the slats of the grating beneath the beaters, each slat being furnished with independent springs, whereby the motes, as they fall upon the grating, are instantly knocked through the spaces between the slats, and are not carried round by the beaters.

MCGAFFIN, JOHN, of Liverpool, Lancaster, engineer. *Improvements in constructing and applying heads to metal casks and vessels.* Patent dated July 25, 1854. (No. 1636.)

This invention consists in the employment of angle or curved iron rings within the ends of vessels made of corrugated iron, where the corrugations run round the vessels.

CUTTING, JAMES A., of Boston, United States, photographer. *An improved process of taking photographic pictures upon glass, and also of beautifying and preserving the same.* Patent dated July 26, 1854. (No. 1638.)

This invention mainly consists in the use of alcohol for the purpose of depriving the gun-cotton, of which the collodion is made, of its moisture after it has been washed to free it from the acids used in its manufacture.

CHURCH, WILLIAM, of Birmingham, Warwick, civil engineer, and SAMUEL ASPINALL GODDARD, of Birmingham, merchant and gun-manufacturer. *An improvement or improvements in ordnance.* Patent dated July 26, 1854. (No 1639.)

This invention comprises the use of a certain collar and recess, a compound wedge, and a moveable face-plate.

PURNELLE, JOHN CHILLCOTT, of Tachbrook-street, Pimlico, Middlesex. *Improvements in obtaining and applying motive power.* Patent dated July 26, 1854. (No. 1641.)

This invention relates to certain arrangements of apparatus by means of which atmospheric air is compressed and employed for exerting pressure alternately upon the upper and under side of a piston working air-tight in a closed cylinder, and fitted with valves acted upon by a tappet motion, &c., &c.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *An improved mill for grinding paint and other moist substances.* (A communication.) Patent dated July 26, 1854. (No. 1642.)

This invention mainly consists in hanging the top stone by pivots, within a ring or frame which is hung by pivots on upright rods, which are capable of adjustment by screws and nuts, so that while the top stone is free to accommodate itself to the runner, facility is at the same time afforded for raising it to allow the stones to cool off when necessary.

KOEFFLER, LOUIS CHRISTIAN, of Rochdale, Lancaster, bleacher and dyer. *Improvements in finishing or polishing yarns or threads.* Patent dated July 26, 1854. (No. 1643.)

This invention relates to a former patent, dated Jan. 31, 1854, and consists—1. In the use of one portion of the yarn as a bed or surface upon which another portion travels. And 2. In mounting the heated surface so as to render it capable of being moved inward or outward.

PONTIFEX, EDMUND ALFRED, of Shoe-lane, London, and CHARLES GLASSFORD, of Ashburnham-grove, Greenwich. *Improvements in obtaining soft lead from hard lead, for the separation of the impurities in hard lead, and for the separation of antimony from these impurities.* Patent dated July 26, 1854. (No. 1644.)

Claim.—Treating hard and impure leads with alkaline matter to separate the impurities, but more especially the antimony and silica. Also separating the antimony from the dross obtained by the process described.

HUCKVALE, THOMAS, of Choice-hill, near Chipping Norton, Oxon. *Improvements in machinery for gathering crops.* Patent dated July 26, 1854. (No. 1645.)

The inventor employs a rake, in combination with endless belts, in such manner, that the rake, being mounted on wheels, as

it is moved over the land, gathers up the crop, and passes it to the endless bands, by which it is raised to the height desired.

TIZARD, WILLIAM LITTELL, of Aldgate, London engineer. *Improvements in fermentation, and in apparatus employed therein.* Patent dated July 26, 1854. (No. 1647.)

This invention consists in combining with a fermenting vessel an external attemperator for the purpose of producing either an ascending or descending circulation of the worts undergoing fermentation; and in the employment of a force-pump or screw propeller in the wort pipe of fermenting apparatus for the purpose of producing or aiding the circulation of the worts. It also consists in three improved processes of fermentation, denominated respectively, the Progressive, the Intermittent and the Accelerating Process. The progressive process consists in keeping the wort or liquor undergoing fermentation in constant circulation through the apparatus during the continuance of the fermenting process, by causing a stream of water to flow through an attemperator at a lower temperature than that of the wort in the fermenting vessel, whereby a continual current will be produced, owing to the difference of temperature between the wort in the fermenting vessel and the water passing through the attemperator. The intermittent process differs from the preceding by the alternate use of hot and cold water in the attemperator, and by occasionally changing the direction of the currents of wort in the vessels from upwards to downwards, and *vice versâ.* The accelerating process is worked in conjunction with either the progressive or intermittent process, or it is conducted independently of either of them. It consists in giving the worts a circulating motion independent of that produced by the difference of temperature between the worts in the attemperator and the fermenting vessel, by means of the screw pump or forcing apparatus connected with the attemperator, which may be worked either by hand, water or steamo wer.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in soldering metals.* (A communication.) Patent dated July 26, 1854. (No. 1650.)

Claim.—Soldering metals by exposing at once the whole length or circumference of the laps of those parts which are to be united to the heated exterior surface of a furnace or heater of suitable construction, whether the soldering be effected solely by the tin which was received by the plate or plates in the tinning process, or by a loose strip of solder.

MOLVÉ, FRANÇOIS DESIRÉ, and PIERRE MARTIN, of Paris, France, engineers. *Certain improvements in heating water for feeding boilers of locomotive and marine steam-engines.* Patent dated July 27, 1854. (No. 1654.)

Claim. — Certain mechanical arrangements applied to or in connection with the chimneys of locomotives and steam-engines, for abstracting and applying the heat generally lost in such chimneys to the supply of heated water to steam boilers.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

MITCHELL, SAMUEL, of Dewsbury, York. *Improvements in the manufacture of cards for carding wool, cotton, silk, and other fibrous materials.* Application dated July 18, 1854. (No. 1583.)

This invention consists in the application of a metallic covering to the leather, cloth, or other material of which the card may be made. This covering serves to protect the "card cloth" from grease, oil, resin, or other injurious matters.

MICHELL, MATTHEW, of Stoke Newington, Middlesex, brewer. *An improvement in furnaces, having for object the consumption of smoke.* Application dated July 19, 1854. (No. 1588.)

The inventor employs as a bridge a thick block of metal, having horizontal perforations formed through it.

WENHAM, FRANCIS HERBERT, engineer, of Effra Vale, Lodge-bridge, Brixton, Surrey. *Certain improvements in steam-engines.* Application dated July 19, 1854. (No. 1589.)

These improvements consist in the application and use of two cylinders, each rotating on its own axis in the same direction and at the same speed, one being placed eccentrically inside of the other, and connected by a flap piston valve or abutment.

JACKSON, GEORGE, of Manchester, Lancaster, decorator. *Certain improvements in the construction of tents.* Application dated July 20, 1854. (No. 1593.)

These improvements consist in producing a roof without a central support, and secured to the poles or shafts, by placing at the apex of the roof a key block, with mortises to receive the rafters.

PALLISER, WILLIAM, of Comragh, Waterford, esquire. *Improvements in projectiles for fire-arms and ordnance generally.* Application dated July 20, 1854. (No. 1597.)

This invention mainly consists in combining wood and metal for the purpose of getting the centre of gravity, or greater part of the weight of the projectile at the fore part of it, and in constructing the pro-

jectiles with helical or straight projections or flanges, for the purpose of causing it to rotate upon its long axis during its flight.

DELABARRE, TOUSSAINT, merchant, of Grenelle, near Paris, France, and LEON BONNET, of the same place. *The preservation of meat in its natural state, and without being cooked.* Application dated July 21, 1854. (No. 1600.)

The inventors first extract about one-half of its water from the meat, and then immerse it for a short time in heated gelatine, made from the bones and sinews of animals; it is afterwards hung up in a well ventilated room and dried, and after hanging for fifteen days, it becomes hard and will keep fresh and good, say the inventors, for years, without being packed.

JEAN, AMAND BENOIT JOSEPH, manufacturer, and ALFRED ALEXANDRE HUGUES, engineer, of Paris, France. *Certain improvements in reducing the friction of axles and bearings, or other rotary rubbing surfaces in machinery.* Application dated July 21, 1854. (No. 1601.)

The inventors construct an axle-box, the internal diameter of which is larger than the diameter of the axle, and place a number of small rollers in the annular space between the axle and box. These rollers are connected together by a ring or annular frame at each end, which keeps them at equal distances apart.

ALEXANDRE, ISAIE. of Bruxelles, but now at Birmingham, Warwick, merchant, and ALFRED SOMMERVILLE, of Birmingham, merchant. *An improvement or improvements in boots and shoes, and in socks or inner soles for boots and shoes.* Application dated July 21, 1854. (No. 1605.)

This invention consists in applying to the interior of the bottoms of boots and shoes wires or plates of copper and zinc, or combinations of such other materials as will form with the aid of the moisture of the foot galvanic or voltaic combinations, for the purpose of imparting vigour to weakly persons.

STEVENS, MARY ANN, of West Derby-street, Liverpool. *Improvements in bonnets.* Application dated July 21, 1854. (No. 1610.)

These improvements consist in forming and applying to bonnets, hoods or shades, in such manner that they may be made to recede within, or shut up to the edge or front of the bonnets.

FRANCIS, HENRY, of the Strand. *An improvement in feeding fuel on to the fire-bars of boiler and other furnaces.* Application dated July 21, 1854. (No. 1612.)

This invention consists in employing *streams* of air or steam passing through suitable tubes or passages above the fire-bars of a furnace in such manner, that the fuel being supplied to these tubes or passages, the blast of air or steam carries it into and distributes it over the fire on the bars.

LAMB, JOHN, of Newcastle-under-Lyne, Stafford, paper manufacturer. *Certain improvements in, or applicable to, machines for making paper.* (A communication.) Application dated July 22, 1854. (No. 1613.)

This invention consists in producing a uniform partial vacuum in a chamber placed across the paper making machine, whereby the paper pulp is deprived of a portion of its moisture before it is taken off the wire-cloth web to be pressed between the couching and tension rollers.

YOUNG, JAMES HADDEN, of College-street, Camden-town, Middlesex. *Improvements in gathering grain and other crops, and securing the same.* Application dated July 22, 1854. (No. 1615.)

In Mr. Young's arrangement, the vehicle employed in its forward progress causes an endless belt, provided with projections, to lift up the grain or other crop into a receptacle placed behind it, and when it is there, a sliding panel, like a piston, is moved by a crank, and compresses it into a proper compass, and holds it firmly until a ligature secures it.

BAINBRIDGE, JOHN, of Ely-place, Holborn-hill, Middlesex, agent. *Improvements in fire-grates, stoves, furnaces, and other similar contrivances.* Application dated July 22, 1854. (No. 1617.)

This invention consists in forming the grate of a number of bars, arranged so as to form a kind of skeleton cylinder, supported by and centered upon an axis.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil-engineer. *Improvements in the treatment, cleansing, and dyeing of fibrous and textile materials.* (A communication.) Application dated July 22, 1854. (No. 1618.)

For the purpose of cleansing the treated materials, and discharging colouring matter, insoluble carbonates, such as carbonate of lime, are used by the inventor; and he employs for mordants hypochloride and muriate of alumina, salts of magnesia, picric and formic acid, and their salts, &c.

DILKS, JAMES, of Parliament-street, Nottingham, lithographer and embosser. *The application of printed or painted linen, cotton, or other textile fabric, either plain or ornamental, for binding more effectually than heretofore packets or parcels of lace, hosiery, or other articles.* Application dated July 22, 1854. (No. 1619.)

This invention consists in the employ-

ment of printed or painted linen, cotton, or other textile fabric, either plain or ornamental, for the purpose named in the title.

COLE, BEAUMONT, the younger, of Deardsend, Knebworth, Hertford, engineer and machinist. *Improved agricultural machinery or apparatus for ploughing and grubbing.* Application dated July 29, 1854. (No. 1626.)

The inventor employs shafts or spindles furnished with shares, coulters, &c., one or more of which shafts he attaches to and combines with suitable framing which connects it with a steam or other engine which will work the plough, and cause the whole to travel over the field by the aid of wheels or rollers.

LAMACRAFT, JOHN, of Westbourne-grove, Middlesex, gentleman. *Improvements in envelopes, or means for securing letters, notes, and similar documents.* Application dated July 26, 1854. (No. 1637.)

In the improved envelope the lap is left loose, as now, and is made in the shape of the flap of a pocket-book, or nearly so, the point or tongue being provided with adhesive substance, both on its outer and inner surfaces, and passed through a slit in the envelope.

OPPENHEIMER, ADOLPHUS, of Manchester, Lancaster, manufacturer. *Certain improvements in the manufacture of mohair velvet or mohair plush, and worsted velvet or worsted plush.* Application dated July 26, 1854. (No. 1640.)

The inventor describes a peculiar arrangement of the threads to be used in the manufacture of the fabrics named in the title.

GODEFROY, PETER AUGUSTIN, of King's Mead Cottages, New North-road, Islington. *Improvements in purifying coal-naphtha and turpentine.* Application dated July 26, 1854. (No. 1646.)

This invention consists in the employment of a suitable stirring-apparatus to stir in, first strong acid, and then water, and to distil the same with free steam.

DELAYE, PIERRE VICTOR, of Paris, France. *Improvements in printing-blocks.* Application dated July 26, 1854. (No. 1648.)

This invention consists in forming the blocks used for printing calico, paper, and similar surfaces, of moveable pieces of type or parallelopipeds.

LUQUES, CONSTANTIN, of Boulevart St. Martin, Paris. *An improved centrifugal governor.* Application dated July 26, 1854. (No. 1649.)

The inventor connects the two balls, or their equivalents, by any suitable springs which act centripetally, and are adjustable by nuts and screws, for the purpose of regulating at will the speed of the governor, &c.

MUMBEY, GEORGE, of Hunter-street, Brunswick-square, Middlesex, mechanical draughtsman. *Improvements in bearings and in the prevention of friction.* Application dated July 27, 1854. (No. 1651.)

"These improvements consist in the application of a non-conducting substance as a substitute for metal in the bearings of machinery;" also the use of powdered talc as a substitute for oil in the prevention of friction.

BURLEIGH, RICHARD CLARKE, of Northumberland-street, Charing-cross, Middlesex. *Improvements in guns, and in the shot or other projectiles fired therefrom.* Application dated July 27, 1854. (No. 1652.)

This invention consists in detaining the shot or other projectile in the gun by mechanical means, and preventing its moving under the impulsive force of the gunpowder until that force has reached any amount desired.

PROVISIONAL PROTECTIONS.

Dated December 12, 1854.

2611. Richard Larkin, lock-maker, of St. John's-villas, Highbury, Middlesex. Improvements in the construction of locks and keys.

Dated January 16, 1855.

109. Urbain Charles Choisnet, of Birmingham, Warwick, lamp-maker, and Charles Emile Giajola, of Birmingham, lamp-maker. Improvements in moderateur lamps.

Dated January 19, 1855.

152. Maurice Delcamp, of Paris, France. An improved apparatus for advertising, or for the exhibition of placards.

Dated January 22, 1855.

166. Robert Johnston, of Drums-lane, Lock-street, Aberdeen, soap-maker. The use of certain portions of fish in the manufacture of soap.

Dated January 23, 1855.

172. John Coates, of Salford, Lancaster, engineer. Improvements in railways.

174. William Dray, of Swan-lane, London, agricultural implement maker. An improved machine for cutting chaff.

176. James Fenton, of Low Moor, York, civil engineer. Improvements in the manufacture of axles, shafts, rods, and bars.

Dated January 24, 1855.

178. Richard Laming, of Carlton-villas, Maida-vale, Middlesex. Improvements in obtaining and combining ammonia.

179. James Webster, of Birmingham, Warwick, engineer. A new or improved method of changing the direction of and multiplying motion.

180. Sir James Caleb Anderson, of Fermoy, Cork, Ireland, baronet. Improvements in steering ships.

181. Charles William Tupper, of the firm of Tupper and Carr, of Mansion House-place, London, galvanized iron manufacturer. Improvements in the construction and arrangement of coverings for buildings.

183. Augustus Edward Schmersahl, of Miles Platting, Lancaster, analytical and practical chemist, and John Augustus Bouck, of the same

place, manufacturing chemist. Improvements in the manufacture of sulphuric acid, and in apparatus for effecting the same.

184. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for raising and forcing fluids. A communication.

Dated January 25, 1855.

185. John Gregory and Audrew Peddie How, of Mark-lane, London, engineers. Certain improvements in steam engines, and in packing for pumps and other machinery in which packing is required.

186. William Winstanley and Joseph Kelly, of Liverpool, Lancaster, engineers. Improvements in pump gear.

187. Barnett Samuel, of Sheffield, York, comb manufacturer. Improvements in the manufacture of knife-handles, umbrella and stick handles, door knobs, articles of furniture, and other articles having the appearance and transparency of solid tortoiseshell.

188. Henry Buckworth Powell, of Foxlease-park, Lyndhurst. An improved precautionary keel, to be applied to vessels when in shallow water or other difficult navigation.

189. Charles Frederick Burnard, of Plymouth, manufacturing chemist. Improvements in the manufacture of super-phosphate of lime.

190. Alexander William Anderson, of Birmingham, Warwick, news agent. Improvements in pasting or exhibiting advertisements.

191. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the construction and arrangement of electric telegraphs, and in the application thereof. A communication from the Chevalier Gaetano Bonelli, of Turin, Sardinia, Director General of Sardinian telegraphs.

192. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for preparing cotton, and similar fibrous materials. A communication from Charles Leyherr, of Laval, France, spinner.

193. George Henry Bursill, of Ranelagh-road, Thames-bank, Pimlico, engineer and assayer of minerals. Improvements in cases or coverings for explosive substances or compounds.

194. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A power accumulator or apparatus to be employed with hydraulic presses. A communication from Jean Baptiste Falguière, of Marseilles.

Dated January 26, 1855.

195. William Townsend, of Coventry, Warwick, machinist. Constructing vehicles without axletrees, and thus affording an improved method of lowering the body of the vehicle.

198. William Beales, of Arlington-street, Camden-town, Middlesex, cartridge maker. Improvements in cartridges.

199. George Bell, of Cannon-street West, London, merchant. Improvements in constructing air springs. A communication.

200. Joseph Leese, junior, of Manchester, Lancaster, manufacturer. Certain improvements in the process of printing calicos and other textile fabrics.

201. William T. Vose, of Massachusetts, United States of America. New and useful improvements in pumps for elevating fluids.

202. Isaac Atkin, of Basford, and St. Mary's-place, Nottingham, lace manufacturer, and Marmaduke Miller, of Vernon-terrace, Nottingham, steam gauge maker. Improvements in apparatus for measuring the supply of water and regulating the supply of fluids.

203. William Richard Morris, of Deptford, Kent, engineer to the Kent Waterworks Company. Improvements in the construction and arrangement of apparatus for preventing the waste of water from service pipes or cisterns.

204. George Searby, of Sloane-street, Chelsea, Middlesex. Improvements in the manufacture of boots and shoes, also applicable to other articles made of or partly formed of leather.

205. Robert Mallet, engineer, of Dublin, Ireland. Improvements in the manufacture of hollow shot and shells, and similar hollow bodies of cast iron or other cast metals.

Dated January 27, 1855.

209. William Onion, of Birmingham, Warwick, manufacturer. An improvement or improvements in gas stoves.

211. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved machine for manufacturing thimbles employed on board ship or elsewhere. A communication.

212. Henry Nightingale, of Chorley, Lancaster, manager, and Robert Nightingale, of the same place, grocer. Improvement in machinery or apparatus for slubbing, roving, and spinning cotton and other fibrous materials.

Dated January 29, 1855.

214. John Wilkins, commercial clerk, of New Charles-street, City-road, Middlesex. An improved mod or method of damping or moistening postage, receipt, or other stamps, adhesive labels, the surface of paper, and other substances.

216. Henri Louis Dormoy, gentleman, of Paris, French Empire. Certain improvements in braiding or plaiting machinery. A communication.

218. John Imray, of Bridge-road, Lambeth, Surrey, engineer. Improvements in locks.

220. Arthur Collinge, of Bridge-road, Lambeth, Surrey, engineer. Improvements in spring hinges.

222. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in looms for weaving. A communication from Gustave Bornèque, of Bavillers, France, manufacturer.

224. Alphonse Pichot, printer, of Poitiers, France. Certain improvements in postage paper and envelopes.

226. Edward Cunnah, brass founder, and John Hampson, time keeper, both of Liverpool, Lancaster. Improved turnstile counting apparatus.

Dated January 31, 1855.

234. Arthur Lyon, of Windmill-street, Finsbury, Middlesex, sausage machine manufacturer. An improvement in sausage-making or mincing machines.

236. George Price, of Wolverhampton, Stafford, manufacturer. Improvements in iron safes, chests, and boxes.

238. Jacques Roux Delguey-Malavas, gentleman, of Montbrison, France. Improved machinery for obtaining and applying motive power.

240 John Francis Porter, of Bessborough-street, Middlesex, civil engineer. Improvements in the manufacture of bricks, and other articles of clay or brick earth.

242. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in machinery for forging nuts and washers. A communication from Charles H. Wateron, of America.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

249. William Soelman, of Bennett-street, Fitzroy-square, gentleman. An invention applicable to shipping and mills, under the title of the Naukinetic or Ship-moving Machine. February 2, 1855.

NOTICE OF APPLICATION FOR LEAVE TO ENTER DISCLAIMER.

An application has been made to Her Majesty's Attorney-General by the patentee and assignee of Letters Patent granted to William Henry Fox Talbot, of Lacock Abbey, Wilts, Esq., and Thomas Augustine Malone, of Regent-street, Middlesex,

photographer, for leave to enter a disclaimer for the purpose of disclaiming certain parts of the specification of the Letters Patent granted to them 19th December, 1849, for "improvements in photography."

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February* 13*th*, 1855.)

2123. William McNaught. Improvements in slide valves for steam engines.
2131. William Peel Gaulton. Improvements in breaks, applicable to railway carriages and other vehicles.
2144. William Frost. Improvements in steam engines.
2145. Thomas Bennett. Improvements in the apparatus employed in the manufacture of gold, silver, and metal leaf.
2147. John Macmillan Dunlop. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.
2148. François Durand. Certain improvements in circular looms.
2149. Andrew Smith. An improved safety cage and apparatus for miners.
2152. William Chambers. Improvements in machinery for beetling cotton and other fabrics.
2165. Valentine William Hammerich. An improved construction of buoyant mattress.
2170. Henry Crosley. Improvements in the manufacture of waddings for cannon and fire-arms.
2175. William Henry Taylor. Improvements in cartouche-belts, or cases for containing cartridges, to be worn round the waist, or otherwise, calculated for arms of every description, guns, pistols, and other fire-arms.
2210. Etienne Bernot. A new machine for cutting files, which he calls Bernot's File-cutting Machine.
2214. Lionel John Wetherell and Augustus Johann Hoffstaedt. An improved construction of pump.
2225. William Eassie. An improved means of securing goods, or loading in or on railway trucks or wagons.
2274. Richard Hugh Hughes. Improvements in transmitting motive power.
2279. John Henry Johnson. Improvements in circular looms. A communication from M. Poivret.
2309. John Henry Johnson. Improvements in axle-boxes. A communication from Benjamin Laurent, of Houécourt, France, manufacturer.
2346. William Childs the younger. An improvement in the manufacture of pipes and tubes.
2441. Charles Asprey. Improvements in handles, particularly applicable to dressing-cases, dispatch-boxes, writing-cases, and other similar articles.
2537. Longin Gantert. Improvements in machinery or apparatus for dyeing and bleaching of yarns or threads.
2538. James Biden. The prevention of smoke from furnaces.
2555. Cromwell Fleetwood Varley. Improvements in producing and applying dynamic electricity.
2611. Richard Larkin. Improvements in the construction of locks and keys.
2706. Edward Loysel. An improved apparatus for cooking or preparing edible substances.
2707. Edward Loysel. A new game combining chance and skill, and the apparatus to be used therewith.
2759. George Edward Dering. Improvements in obtaining motive power when using electric currents.
26. George Walker Muir. Improvements in warming and ventilating.
66. Henry Bessemer. Improvements in the manufacture of iron and steel.
136. William Pidding. Improvements in the manufacture of combs for the human hair.
137. William Pidding. Improvements in the manufacture of building materials, and in the machinery or apparatus for making the same.
138. William Pidding. Improvements in coverings for the feet of bipeds and quadrupeds.
150. Pierre Charles Paul Laurent-Préfontaine. An improved engine, called hydraulic sling, for raising water and other liquids, or heavy bodies.
155. William Douglas and John Carswell. Improvements in dyeing woven fabrics.
156. Scipion Salaville. An improved method of preserving and purifying grain and seed.
166. Robert Johnston. The use of certain portions of fish in the manufacture of soap.
170. William Kilgour. An improved manufacture of naphtha, paraffine, and paraffine oil.
171. Peter Arkell. An improved mode of purifying whale and seal oils.
177. George Brooks Pettit and Henry Fly Smith. Improvements in stoves and other apparatus for generating heat from gas, and in the employment and removal of the vapours produced by its combustion.
181. Charles William Tupper. Improvements in the construction and arrangement of coverings for buildings.
191. John Henry Johnson. Improvements in the construction and arrangement of electric telegraphs, and in the application thereof." (A communication from the Chevalier Gaetano Bonelli, of Turin, Sardinia, director-general of Sardinian telegraphs.)
196. John Lamacraft. Improvements in envelopes, or means for securing letters, notes, and similar documents.
201. William T. Vose. New and useful improvements in pumps for elevating fluids.
202. Isaac Atkin and Marmaduke Miller. Improvements in apparatus for measuring the supply of water and regulating the supply of fluids.
203. William Richard Morris. Improvements in the construction and arrangement of apparatus for preventing the waste of water from service-pipes or cisterns.
208. Samuel Mayer and William Bush. Improvements in reducing flint and other substances, rendering them suitable for the manufacture of porcelain, and other earthenware articles.
213. Auguste Léopold Lenoir. Improvements in breech-loading fire-arms.
220. Arthur Collinge. Improvements in spring hinges.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed February 9, 1855.

1764. George Weston.
1771. William Todd and Jacob Todd.
1800. Julian Bernard.
1854. Aristide Balthazard Bérard.
1875. Richard Archibald Brooman.
1878. Auguste Antoine Legras.
1921. Pierre André Decoster.
2017. Samuel Crabtree.
2213. William Wain.
2494. Walter Blundell.
2534. Robert Christopher Witty.

2570. John Fairrie.
2584. Edward Acres.
2634. William Charles Day.
2683. William Donald and William Heginbotham.

Sealed February 13, 1855.

1773. Henry Smith.
1775. John Greaves and Charles Michael Greaves.
1779. Robert Caunce.
1792. Thomas Wallworth.
1797. John Hackett.
1801. Louis Christian Koeffler.
1816. Samuel Kershaw and James Taylor.
1830. William Vitruvius Greenwood and John Saxby.
1831. James Worrall, junior.
1836. Stopford Thomas Jones.
1838. Robert Barlow Cooley.
1880. Robert McConnel.
1905. Julian Bernard.
1915. Joseph Worthington.
1962. Robert Macallister.
2390. Eugene Antoine Lépine.
2460. Alfred Tylor.
2471. William Aristides Vérel.
2574. Richard Archibald Brooman.
2598. James John King and Thomas Brindley.
2617. John Nesmith.
2698. John Henry Johnson.
2708. John Henry Johnson.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

J. H. R.—Bourdon's instrument is used mainly for registering the pressures of elastic fluids. We do not think it could be well applied as a gauge for a powerful Bramah's press.

A person who has invented and got to work a piece of machinery, cannot be interfered with in his use of it by another who subsequently makes it the subject of a patent.

C. L., Hoxton.—Can you inform us on what day the Provisional Protection was obtained for the battery you mention?

X.—No.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1646.] SATURDAY, FEBRUARY 24, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

JANDIN AND DUVAL'S IMPROVEMENTS IN DRESSING AND DYEING RAW SILK FABRICS.

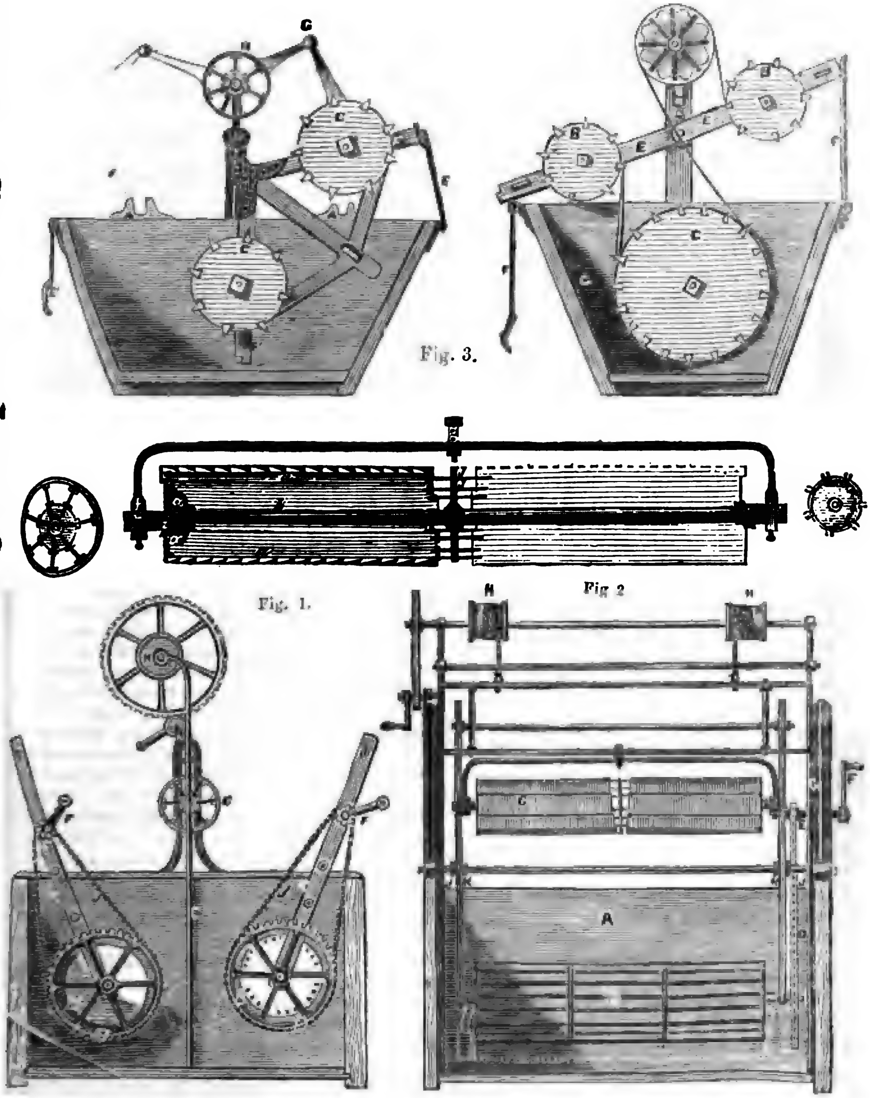


Fig. 4. Fig. 5. Fig. 3. Fig. 1. Fig 2.

JANDIN AND DUVAL'S IMPROVEMENTS IN DRESSING AND DYEING RAW SILK FABRICS.

(Patent dated—as a communication to R. A. Brooman—July 21, 1854.)

MESSRS. JANDIN AND DUVAL, of Lyons, have recently patented in this country an invention which consists "in holding raw silk fabrics in a state of tension, both in length and breadth, while being dressed (or deprived of the gummy matter contained in them) and dyed."*

By this arrangement, fractures of the silk which occur in other methods for effecting the same object are avoided, and a fabric is produced having the same appearance and effect as if it had been manufactured of silk which had been dyed before being woven, instead of that of a fabric dyed in the piece; while fabrics manufactured in raw silk may be dressed in eight or ten days, by having the gummy matter boiled out of them, and may be dyed of any desired colour to suit the taste of the manufacturer or purchaser. The invention applied to inferior raw silk goods, such as handkerchief pieces, produces an article stronger and of brighter colours than usual.

The raw silk fabric is kept in a state of tension in the direction of both length and breadth by being passed from one roller to another over an intermediate breadth stretching-drum, and is dressed by being immersed in a vessel containing a solution of soap (maintained at boiling point) for about three quarters of an hour, by which the gummy matters are removed from it. The fabric is then washed in a suitable vat in order to remove the soap, then receives the mordant, and is afterwards dyed; tension, both lengthwise and breadthwise, being maintained throughout the whole of the processes.

The manner in which the invention may be performed is represented in the accompanying engravings. Figs. 1 and 2 are views of the apparatus employed in the dressing process, for removing the gummy matter from the silk, the former being an end view, and the latter a front elevation. A is a vessel heated by steam passing through a coil at the bottom of it, or otherwise; B B are rollers, upon which the fabric is wound and unwound; C is a stretching-drum, round which it is passed while being unwound from one and wound on to the other of the rollers, B B. This drum, C, is made to rise and fall in the guides, G G, by pulleys and ropes, H H. E is a toothed pinion worked by a handle, F, and D is a toothed wheel for communicating rotary motion to the rollers, B B, through the endless chain, J, which gears into the teeth of the wheel, D, and pinion, E; K K are levers for removing the rollers, B B, from the vat.

Fig. 3 is a view, chiefly in section, of the drum employed for stretching the fabric breadthwise. One half only of this drum is shown in detail. *b* is the axis of the drum; *a a* are segmental bands of brass or other suitable metal of which the drum is composed, their outer surfaces being serrated. The serrations or teeth on all the segments forming one-half of the drum inclines to the right, and those on the segments of the other half to the left. *c c* are discs keyed to the shaft, *b*; *d d* are levers connected at one end to the segments, *a a*, while their other ends work in inclined groove wheels, as is hereafter explained, so as to impart a to-and-fro movement to the bands, *a a*. There is one lever for every band or segment. *e e* are semi-cylindrical grooved wheels fixed in an inclined position upon sockets. The levers, *d d*, work into the grooves of these wheels, and, by following their inclination, produce the to-and-fro motion of the bands, *a a*, in the direction of their length, and in a reverse direction to each other on each of the drums. *f* is a bent rod, carrying at each end a socket, which becomes the bearing of the axis of the drum, and supports also the inclined semi-cylindrical grooved wheels, *e e*. *g* is a centre-pin, by which the rod, *f*, is suspended, and upon which it is free to turn. The inner ends of the segmental serrated bands are supported upon pins or bolts, *j j*, which pass through an eye cast on or otherwise fixed to the inside of the bands. The pins or bolts are supported by a ring or disc, *h*, keyed to the axis, *b*. The fabric, after being passed four or five times from one roller to the other over the breadth stretching-drum will be found to be dressed. Care must be taken on winding the fabric from roller to roller to turn round the breadth stretching-drum so that the inclinations of the teeth on the segments shall always be presented in the same position to the fabric.

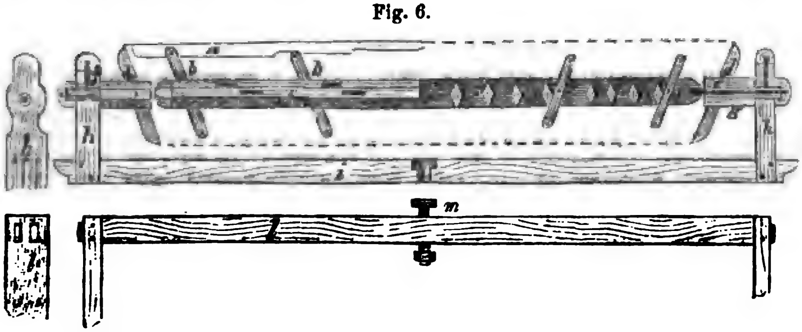
After having had the gum boiled out, the fabric is next to be washed, and for this purpose it is removed to such an apparatus as that shown at fig. 4, which is an end view; A A are supports or bearings, on which the rollers are placed when removed from the dressing apparatus; B is a stretching drum, similar to that shown at fig. 3; C C', the rollers off and on which the fabric is rolled; these rollers are worked by a crank handle; F F' are arms

* See last Number, page 160.

of a frame on which the rollers, C C′, are mounted; E E′, hooked rods, for retaining the arms in the required positions; G is a perforated pipe, for sprinkling the fabric.

After being washed, the fabric is next taken to the dyeing vat. Fig. 5 is a sectional elevation of the apparatus used for dyeing; A is a stretching-drum, made of wood and shown in detail at fig. 6; B B are rollers, on and off which the fabric is wound and unwound, after being passed through the bath and over the stretching drum; C is a cylindrical frame, centred and turning on bearings, D D. This frame is intended to hold the fabric while it is immersed in the dye-bath. E E are moveable arms or levers, on which

Fig. 6.



the rollers, B B, are mounted, and by means of which these rollers may be moved nearer to or farther from the stretching-drum, A; F F are hooked rods for retaining the arms, E, in the required positions; G is a wooden vat, in which the dye-bath is placed; H is a guide roller. Fig. 6 shows the construction of the breadth stretching-drum; A A are bands of wood, of the shape shown at A in the plan, fig. 3, and having mortices cut out on the inside, into which bars, *b b*, take; each bar, *b*, is connected to a band, *a*, at each end, and is centred upon a pin in the shaft, *c*; this shaft is octagonal and the bars, *b*, pass through mortices in the shaft, the faces of which are all inclined; *d d* are discs or wheels centred on a pin in the spindle, *e*; their inclination is adjusted so as to afford more or less play to the bands, *a a*, by means of the screws, *s s*; *e* is the spindle; *f f* are tightening screws, for holding the spindles, *e*, in their bearings; *g g* are pins screwed in the spindles, *e*, which support the stretching-drum, and become the axes on which the shaft, *c*, revolves; *h h*, bearings for the spindles, *e e*; *i* is a cross bar for supporting the bearings, *h h*; *l* is a frame fixed to the vat on which the stretching-drum and its appendages are mounted; *m* is a bolt by which the frames, *i l*, are held together, and which forms a centre upon which the stretching-drum may be turned.

The process is as follows:—A number of pieces of fabric are first divided into lots of six or eight pieces, according to their length. One lot, of not more than about 200 yards, is wound round a portable roller, which is afterwards placed on the vat, A, and from which the fabric is passed on to the rollers, B B (fig. 1), at the bottom of the vat. A solution of soap in water is then poured into the vat, *a*, to cover over the rollers, B B, and steam is let on in order to raise the solution to the boiling point, the fabric being passed from one roller over the drum, C, to the other roller, four or five times, the breadth stretching-drum being hoisted up and turned round each time, in order that the right and left hand diverging edges may always be presented in the same position to the fabric. The piece is then removed from the bath by the rollers, B B, which are lifted by means of the levers, K K, connected to their ends, transferred to the portable roller previously mentioned, and allowed to drain.

The portable roller is now placed on the bearings, A A, fig. 4, and the piece rolled off it, over the stretching-drum, B, and thence to the roller, C; the portable roller being then removed. The crank handle, before-mentioned, is unscrewed, the hook, E, which holds up the arm, F, is unfastened so as to allow the roller, C, to descend. The drum, B, is turned in order to present the proper side of the fabric. The other of the arms, F, is fastened, or hooked up, so as to cause the other roller, C, which had been out of the water, to pass into it, and the first roller to be lifted out. The handle is now replaced and turned. This first part of the operation is performed in water heated to about 125° containing about a pound of carbonate of soda. When the fabric has been twice passed through this bath, a valve is opened and the water drawn off from the vat, which is again filled with

cold water which flows through perforated pipes, G, so as to fall on the fabric, on the stretching-drum, and on the roller on to which it is being wound, while the roller from which it is being unwound is kept immersed in the water.

The fabric having been so treated four or five times, will be free from soap, and ready for dyeing. It is again rolled on to the portable roller, before referred to, and transferred to the mordant and dyeing baths, shown in fig. 5, and there passed through the mordant bath and the dye bath, being all the time kept in a state of tension as before. The only difference between the construction of the dyeing apparatus and the washing apparatus consists in the frame, C, intended for holding the fabric while immersed in the bath, and in the rollers, which move separately, the fabric being handled in the same manner.

THE CAPSIZING OF THE TROOP-SHIP "PERSEVERANCE."

Of all the unanticipated spectacles brought before us since the outbreak of the present war, there probably has not been one more remarkable than that which was witnessed in the Royal Dockyard at Woolwich, when one of Her Majesty's ships, on being floated in dock, started from her upright position and rolled leisurely over, till her masts came down upon the ground. Such a circumstance is of importance, not only on account of the results immediately following it, but also because it suggests considerations and excites apprehensions which greatly tend to the disquietude of the public mind. Men ask, and ask with reason, "If the Admiralty provide us with one ship which rolls over in their own docks, and before the eyes of their own executive officers, may they not have provided, or be now providing, us with others, which, while they are stable enough to bear our regiments with safety from our harbours, may, nevertheless, pitch them out into the Bay of Biscay or the Black Sea, when the first storm overtakes them?" They begin to doubt whether the same fatal hand that has slain one army before Sebastopol, is not likely to seize upon the elements of another on their way thither; and whether Mr. Bernal Osborne is not to be numbered among the lords of misrule, notwithstanding the boldness with which he calls upon the House of Commons to admire the perfection of his own department of the Royal service.

Undoubtedly, when a vessel, in which a thousand British troops are about to be deposited, suddenly capsizes in still water, some ready explanation of the fact may fairly be demanded. The elucidation put forth by the Duke of Newcastle in the House of Lords, viz., that the shores were removed from the ship too soon—however effectual it may have been in silencing the interrogator of the Government, is quite unfit to be entertained for a moment. Every person who has ever seen a large ship undocked in a Royal dockyard, must be perfectly well aware that the upper tier of shores (breast-shores) are allowed to remain until the vessel is fairly afloat. But even if this were not the case, and if the shores were actually removed before the water in the dock had altogether floated her, it could only be by an extraordinary combination of instability of form, and inequality in the distribution of the weights on board the vessel, that such a result could be brought about. In addition to these considerations we may add, that we have been assured by eye-witnesses of the occurrence, that nothing transpired during the undocking of the *Perseverance* which could lend the smallest show of truth to the statement of the War Minister.*

To us nothing mysterious appears to be involved in the circumstance under notice, and nothing accidental is necessary for its explanation. Those of our readers who have carefully studied the disquisitions on the science of naval architecture which have from time to time appeared in our pages, will have observed, that the height of the centre of gravity of a ship always enters into the expression representing her stability in such a manner, that the stability diminishes as it increases, and *vice versâ*. It is evident, therefore, that for every ship there is a maximum height, beyond which her centre of gravity cannot with safety be elevated, a given displacement and draught of water being assumed. This height is generally much less in merchant or passenger ships, than in ships of war of the same tonnage; because, while the latter are expressly formed to carry great weights, such as those of guns and shot, &c., above the water line, the former are constructed to carry the principal portions of their burdens in their holds, and but comparatively small weights upon their decks. Now, the *Perseverance* was built to carry merchandize and passengers; but having been purchased by the government for the

* Since the above remarks were written, Admiral Berkeley has contradicted, in the House of Commons, the statement made by the Duke of Newcastle.

transport of troops, she has had a poop and a forecastle added to her, and has unquestionably been furnished with much heavier masts and yards than she was originally intended to carry. By these and other additions of weight above the water line of the vessel, she has, beyond doubt, had her stability, (which was probably scarcely sufficient even for her original purpose) too much diminished, and the inevitable result has followed.

It is evident, therefore, that a mistake has been made, and a costly vessel has been purchased, and appropriated by the Admiralty to a purpose for which she was quite unsuited. We know how easy a matter it would be to pursue the subject further, to show that the error committed was avoidable, and to endeavour to fix the responsibility upon those whose business it is to expend the public funds with caution and economy. But we think it more to the public interest to point out the cause from which, we believe, this and other similar evils have arisen, viz., the disproportion that exists between the staff of the Surveyor of the Navy's Department, and the duties that devolve upon it, especially at a time like this, when the Admiralty profess to be putting forth the full naval strength of this great nation.

Let any competent person consider for a moment the amount of labour that has fallen to the lot of the surveyor's department, only in these three great divisions of its duties, viz.—the construction of new ships, the conversion of sailing into screw vessels, and the hire and purchase of suitable vessels for transport service! And who have there been to execute this? A post captain for surveyor, two professional assistants (only one of whom has received a thoroughly professional education), and some four or five draftsmen; these latter being, in almost all cases, taken from the offices of the dockyards, never having received any further direct theoretical culture than what is abroad in the mould-lofts of those establishments, which we confidently pronounce to be but small, and to fall altogether short of that necessary for the determination of the essential qualities of ships, such as statical and dynamical stability, &c. This is the staff appointed by the Admiralty to furnish to the dockyards complete instructions for the conduct of works, on which upwards of one million pounds for artificers' wages and nearly three millions for the stores converted, are to be expended during the ensuing year! It is an incontestible fact that the Government of this great maritime country, which prides itself on its skill in naval architecture, and its supremacy upon the seas, has not in its pay one individual whose undivided duty it is to perform those calculations which must necessarily be effected before the true qualities of a single ship can be determined!

These things tend to excite inquiry once more into the attitude assumed by our naval administrators towards those who have pursued or are pursuing studies connected with the more theoretical branches of the science of naval architecture, and therefore into the prospects of the science itself among us. We cannot now extend our remarks upon the subject, but shall return to it hereafter. Let it suffice for the present to say that the fatal blight—proceeding as much from stupidity as from corruption—which is now seen to have fallen upon all public departments, has descended thickly upon this. A single glance at our dockyard establishments attests the truth of this statement. The members of the first school established by the Government for the improvement of naval architecture, are just now stepping, grey-headed, into leading positions, after years of systematic depreciation, while those of the late School of Mathematics and Naval Construction, whether meritorious or otherwise, are tossing about in the most humiliating positions that can be found for them, and are subjected to frequent indignities, from which an arduous and extended course of mental culture should at all times be a protection.

We have hinted in our previous remarks at only a few of the defects in the administration of Admiralty Boards in connection with our dockyard establishments. But, as we write, innumerable others rise up before us, and claim our future consideration. Among these are the paralyzing influences which result from the placing of the mechanical departments of the dockyard under the control of captain and admiral superintendents, an arrangement by which the plans and orders of well-informed professional officers, are daily annulled by the mere caprices of men, who are commissioned with authority to dictate even where they are incompetent to advise, and to adjudicate on matters of which they are necessarily ignorant:—The modern system of promotion through the various grades of office, which system, while it certainly opens up a readier way to preferment for deserving persons, at the same time opposes but an inconsiderable barrier to the progress of incompetent but favoured candidates for advancement, often conferring the prize upon one who, though without skill in his profession, scrambles through a meagre examination in the most elementary mathematics, and witholding it from another whose abilities and experience commend him to office:—And the vast outlay that has been made in attempts to introduce and

perfect a method by which the wages of the workpeople employed are apportioned according to a system of measurement, which is, after all, a most costly and inefficient system, and one which, as we are prepared to show, is productive of evils which cannot be too strongly condemned. These we shall hereafter consider, and endeavour to throw much light upon.

Meanwhile we content ourselves with suggesting, that the accident with the *Perseverance* plainly calls for the adoption of measures which shall enable the Surveyor of the Navy's department to be more efficiently conducted. Why should there not be persons appointed not only to examine the qualities of those vessels which the Admiralty require for present emergencies, but to ascertain and record the qualities of so much of the mercantile navy as is likely to be required at any future time for extraordinary service? For a most insignificant annual sum the Admiralty might constantly supply themselves with this information, and thus prepare themselves for the exigencies to which a great State is continually liable.

ON THE PENDULUM EXPERIMENTS IN HARTON COLLIERY.

BY THE ASTRONOMER ROYAL.*

THE Lecturer commenced with remarking that the bearing of the experiments, of which he was about to give a notice, was not limited to their ostensible object, but that it applied to all the bodies of the solar system. The professed object of the experiments was to obtain a measure of the density of the earth, and therefore of the mass of the earth (its dimensions being known); but the ordinary data of astronomy, taken in conjunction with the laws of gravitation, give the proportions of the mass of the earth to the masses of the sun and the principal planets; and thus the determination of the absolute mass of the earth would at once give determinations of the absolute masses of the sun and planets. To show how this proportion is ascertained, it is only necessary to remark that a planet, if no force acted on it, would move in a straight line; that, therefore, if we compute geometrically how far the planet moves in a short time, as an hour, and then compute the distance between the point which the planet has reached in its curved orbit, and the straight line which it has left, we have found the displacement which is produced by the sun's attraction, and which is therefore a measure of the sun's attraction. In like manner, if we apply a similar calculation to the motion of a satellite during one hour, we have a measure of the attraction of its primary. The comparison of these two gives the proportion of the attraction of the sun, as acting upon a body at one known distance to the attraction of a planet, as acting upon a body at another known distance. It is then necessary to apply one of the theorems of the laws of gravitation, namely, that the attraction of every attracting body is inversely as the square of the distance of the attracted body, and thus we obtain the proportion of the attractions of the sun and a planet when the bodies upon which they are respectively acting are at the same distance from both; and finally, it is necessary to apply another theorem of the law of gravitation, namely, that the attractions thus found corresponding to equal distances of the attracted bodies, are in the same proportion as the masses of the attracting bodies (a theorem which applies to gravitation, but does not apply to magnetic and other forces). Into the evidence of these portions of the law of gravitation the Lecturer did not attempt to enter: he remarked only that they rest upon very complicated chains of reasoning, but of the most certain kind. His only object was to show that the proportion of the masses of all bodies, which have planets or satellites revolving round them, can easily be found (the proportion for those which have no satellites is found by a very indirect process, and with far less accuracy); and that if the absolute mass of the earth be known, the absolute mass of each of the others can be found. As their dimensions are known, their densities can then be found. Thus it rests upon such inquiries as those on which this lecture is to treat, to determine (for instance) whether the planet Jupiter is composed of materials as light as water, or as light as cork.

The obvious importance of these determinations had induced philosophers long since to attempt determinations of the earth's density; and two classes of experiments had been devised for it.

The first class (of which there was only one instance) is the attraction of a mountain in the noble Schehallien experiment. It rests, in the first place, upon the use of the zenith sector; and, in the next place, upon our very approximate knowledge of the dimensions of the earth. [The construction of the zenith sector was illustrated by a model; and it was shown, that if the same star were observed at two places, the telescope would necessarily be pointed in the same direction at the two places, and the

* The substance of a paper recently read at the *Royal Institution*.

difference of direction of the plumb-line, as shown by the different points of the graduated arc which it crossed at the two places, would show how much the direction of gravity at one place is inclined to the direction of gravity at the other place.] Now, from our knowledge of the form and dimensions of the earth, we know that the direction of gravity changes very nearly one second of angle for every 100 feet of horizontal distance. Suppose, then, that two stations were taken on Schehallien, one on the north side and the other on the south side, and suppose that their distance was 4,000 feet, then, if the direction of gravity had not been influenced by the mountain, the inclination of the directions of gravity at these two places would have been about 40 seconds. But suppose, on applying the zenith sector in the way just described, the inclination was found to be really 52 seconds. The difference, or 12 seconds, could only be explained by the attraction of the mountain, which, combined with what may be called the natural direction of gravity, produced directions inclined to these natural directions. In order to infer from this the density of the earth, a calculation was made (founded upon a very accurate measure of the mountain) of what would have been the disturbing effect of the mountain if the mountain had been as dense as the interior of the earth. It was found that the disturbance would have been about 27 seconds. But the disturbance was really found to be only 12 seconds. Consequently the proportion of the density of the mountain to the earth's density was that of 12 to 27, or 4 to 9 nearly. And from this, and the ascertained density of the mountain, it followed that the mean specific gravity of the earth would be about five times that of water. The only objection to this admirable experiment is, that the form of the country near the mountain is very irregular, and it is difficult to say how much of the 12 seconds is or is not really due to Schehallien.

The second class is what may be called a cabinet experiment, possessing the advantage of being extremely manageable, and the disadvantage of being exceedingly delicate, and liable to derangement by forces so trifling that they could with difficuty be avoided. Two small balls upon a light horizontal rod were suspended by a wire, or two wires, forming a torsion balance, and two large leaden balls were brought near to attract the small balls from the quiescent position. We could make a calculation of how far the great balls would attract the little ones, if they were as dense as the general mass of the earth; and comparing this with the distance to which the leaden balls really do attract them, we find the proportion of the density of the earth to the density of lead. The peculiar difficulty and doubt of the results in this experiment depend on the liability to disturbances from other causes than the attraction of the leaden balls, especially the currents of air produced by the approach of bodies of a different temperature; and after all the cautions of Cavendish, Reich, and Baily, in their successive attempts, it seems not impossible that the phenomena observed may have been produced in part by the temperature of the great balls as well as their attraction.

These considerations induced the lecturer, in 1826, to contemplate a third class of experiments; namely, the determination of the difference of gravity at the top and the bottom of a deep mine, by pendulum experiments. Supposing the difference of gravity found, its application to the determination of density (in the simplest case) was thus explained:—Conceive a spheroid concentric with the external spheroid of the earth to pass through the lower station in the mine. It is easily shown that the attraction of the shell included between these produces no effect whatever at the lower station, but produces the same effect at the upper station as if all its matter were collected at the earth's centre. Therefore, at the lower station we have the attraction of the interior mass only: at the upper station we have the attraction of the interior mass (though at a greater distance from the attracted pendulum), and also the attraction of the shell. It is plain that by making the proportion of these theoretical attractions equal to the proportion actually observed by means of the pendulum, we have the requisite elements for finding the proportion of the shell's attraction to the internal mass's attraction, and therefore the proportion of the matter in the shell to the matter in the internal mass; from which the proportion of density is at once found. Moreover, it appeared probable, upon estimating the errors to which observations are liable, that the resulting error in the density, in this form of experiment, would be less than in the others.

Accordingly, in 1826, the lecturer, with the assistance of his friend, Mr. Whewell (now Dr. Whewell), undertook a series of experiments, at the depth of nearly 1,200 feet, in the Dolcoath mine, near Camborne, in Cornwall. The comparison of the upper and lower clocks (to which further allusion will be made) was soon found to be the most serious difficulty. The personal labour was also very great. They had, however, made a certain progress when, on raising a part of the instruments, the straw packing took fire

(the origin of the fire is still unknown), and partly by burning, and partly by falling, the instruments were nearly destroyed.

In 1828, the same party, with the assistance of Mr. Sheepshanks and other friends, repeated the experiment in the same place. After mastering several difficulties, they were stopped by a slip of the solid rock of the mine, which deranged the pumps, and finally flooded the lower station.

The matter rested for nearly twenty-six years, the principal progress in the subjects related to it being the correction to the computation of "buoyancy" of the pendulum, determined by Colonel Sabine's experiments. But in the spring of 1854, the manipulation of galvanic signals had become familiar to the Astronomer Royal, and the assistants of the Greenwich Observatory; and it soon occurred to him that one of the most annoying difficulties in the former experiment might be considered as being practically overcome, inasmuch as the upper and lower clocks could be compared by simultaneous galvanic signals. Inquiries made in the summer, induced him to fix on the Harton colliery, near South Shields, where a reputed depth of 1,260 feet could be obtained; and as soon as this selection was known, every possible facility and assistance were given by the owners of the mine. Arrangements were made for preparing an expedition on a scale sufficient to overcome all anticipated difficulties. A considerable part of the expense was met by a grant from the Board of Admiralty. The Electric Telegraph Company, with great liberality, contributed (unsolicited) the skill and labour required in the galvanic mountings. The principal instruments were lent by the Royal Society. Two observers were furnished by the Royal Observatory, one by the Durham Observatory, one by the Oxford Observatory, one by the Cambridge Observatory, and one by the private observatory of Red Hill (Mr. Carrington's). Mr. Dunkin, of the Royal Observatory, had the immediate superintendence of the observations.

The two stations selected were exactly in the same vertical, excellently walled, floored, and ceiled; the lower station, in particular, was a most comfortable room or rather suite of rooms. Every care was taken for solidity of foundation and steadiness of temperature. In each (the upper and the lower) was mounted an invariable brass pendulum, vibrating by means of a steel knife edge upon plates of agate, carried by a very firm iron stand. Close behind it, upon an independent stand, was a clock, carrying upon the bob of its pendulum an illuminated disc, of diameter nearly equal to the breadth of the tail of the invariable pendulum; and between the two pendulums was a chink or opening of two plates of metal, which admitted of adjustment, and was opened very nearly to the same breadth as the disc. To view these, a telescope was fixed in a wall, and the observer was seated in another room. When the invariable pendulum and the clock pendulum pass the central points of vibration at the same instant, the invariable pendulum hides the illuminated disc as it passes the chink, and it is not seen at all. At other times it is seen in passing the chink. The observation, then, of this disappearance determines a coincidence with great precision. Suppose the next coincidence occurs after 400 seconds. Then the invariable pendulum (swinging more slowly), has lost exactly two swings upon the clock pendulum, or the proportion of its swings to those of the clock pendulum is 398 : 400. If an error of a second has been committed, the proportion is only altered to 397 : 399, which differs by an almost insignificant quantity. Thus the observation, in itself extremely rude, gives results of very great accuracy. As the proportion of invariable-pendulum-swings to clock-pendulum-swings is thus found, and as the clock-pendulum-swings in any required time are counted by the clock dial, the corresponding number of invariable-pendulum-swings is at once found. Corrections are then required for the expansion of the metal (depending on the thermometer-reading), for the arc of vibration, and for the buoyancy in air (depending on the barometer reading).

But when the corrected proportion of upper-invariable-pendulum-swings to upper-clock-pendulum-swings is found, and the proportion of lower-invariable-pendulum-swings to lower-clock-pendulum-swings is found, there is yet another thing required, namely, the proportion of upper-clock-pendulum-swings to lower-clock-pendulum-swings in the same time; or, in other words, the proportion of the clock rates. It was for this that the galvanic signals were required. A galvanometer was attached to each clock, and an apparatus was provided in a small auxiliary clock, which completed a circuit at every 15 seconds nearly. The wire of this circuit, passing from a small battery through the auxiliary clock, then went through the upper galvanometer, then passed down the shaft of the mine to the lower galvanometer, and then returned to the battery. At each galvanometer there was a small apparatus for breaking circuit. At times previously arranged, the circuit was completed by this apparatus at both stations, and then it was the duty of the observers at both stations to note the clock times of the

same signals; and these evidently give comparisons of the clocks, and therefore give the means of comparing their rates. Thus (by steps previously explained), the number of swings made by the upper pendulum is compared with the number of swings made in the same time by the lower pendulum.

Still the result is not complete, because it may be influenced by the peculiarities of each pendulum. In order to overcome these, after pendulum A had been used above and pendulum B below, they were reversed; pendulum B being observed above and A below; and this, theoretically, completes the operation. But in order to insure that the pendulum received no injury in the interchange, it is desirable again to repeat the experiments with A above and B below, and again with B above and A below.

In this manner the pendulums were observed with 104 hours of incessant observations, simultaneous at both stations, A above and B below; then with 104 hours, B above and A below; then with 60 hours, A above and B below; then with 60 hours, B above and A below. And 2454 effective signals were observed at each station.

The result is, that the pendulums suffered no injury in their changes; and that the acceleration of the pendulum on being carried down 1260 feet is $2\frac{1}{4}$ seconds per day, or that gravity is increased by $\frac{1}{19190}$ part.

It does not appear likely that this determination can be sensibly in error. The circumstances of experiment were, in all respects, extremely favourable; the only element of constant error seems to be that (in consequence of the advanced season of the year) the upper station was cooler by 7° than the lower station, and the temperature reductions are therefore liable to any uncertainty which may remain on the correction for 7°. The reductions employed were those deduced by Sabine from direct experiment, and their uncertainty must be very small.

If a calculation of the earth's mean density were based upon the determination just given, using the simple theory to which allusion is made above, it would be found to be between six times and seven times the density of water. But it is necessary yet to take into account the deficiency of matter in the valley of the Tyne, in the hollow of Jarrow Slake, and on the sea-coast. It is also necessary to obtain more precise determinations of the specific gravities of the rocks about Harton colliery than have yet been procured. Measures are in progess for supplying all these deficiencies. It seems probable that the resulting number for the earth's density will probably be diminished by these more accurate estimations.

ON THE FLOW OF WATER THROUGH PIPES AND ORIFICES.

At the Institution of Civil Engineers, on Tuesday, February 13th, the evening was entirely devoted to the consideration of Mr. Leslie's paper on the above subject, published in our last Number.

In the discussion, when moving a vote of thanks to the author for his interesting paper, it was stated to be only due to his position in the profession, to direct his attention to certain points which appeared to require revision, before the paper was printed. The paper might be divided into two heads; 1st. As to the accuracy of the experiments themselves; and, 2nd. As to the extent to which they might be considered as a test of the accuracy of the formula of Du Buat. With regard to the experiments, in the cases of low velocities and flat gradients, due precautions did not appear to have been taken for guarding against obstructions, especially from the effect of the accumulation of air. For instance, in the second series of experiments, with a pipe 500 feet long, it was obvious that the results could not be relied upon. In experiment 1, with a gradient of 1 in 2,000, the flow of water was stated as ·3243, whereas in the preceding series of experiments the flow was stated to be ·7407, with a flatter gradient of 1 in 2,391. In experiment 5, of the second series, the flow was stated to be 2·18, with a gradient of 1 in 220; whereas in the preceding series, in experiment 8, the flow was stated to be 3· with a gradient of 1 in 230. These were examples of the discrepancies, more or less pervading the whole of the experiments of the class.

With regard to the test of the formula of Du Buat, the author had adopted a formula, which omitted from it all those corrections which were introduced by Du Buat, with the express view of meeting the case under consideration. On applying Du Buat's formula to the author's experiments, the alleged discrepancies were, however, reduced; for instance, in experiment 1, first series, in place of being as 4 to 1, they were only about $2\frac{1}{4}$ to 1. In experiment 2, in place of being 2 to 1, they were as 3 to 2; and in experiment 4, in place of a discrepancy, as represented, of about 3 to 2, the results were nearly identical.

Referring to the experiments by Mr. Provis, quoted from the "Trans. Inst. C.E.," vol. ii., the author had omitted, in the deductions, to allow for the head due to the velocity generated in the pipes. That

allowance being made, and the correct formula applied, the results were identical with those of Du Buat; affording a strong confirmation of the accuracy of Du Buat, not only as regards the formula, but also as to the experiments upon which that formula was based.

While on that subject, as there appeared to be at present a strong tendency on the part of public boards to invalidate established formulæ, and to introduce others affording larger results, the attention of all who desired to investigate the subject was directed to the article "Theory of Rivers," in Dr. Robison's "Mechanical Philosophy," vol. ii., page 388. By an attentive perusal of the article, they would not only be confirmed in their faith in the experiments and formulæ of Du Buat, but they would be satisfied how little practical result depended upon whether, in point of fact, the flow of water was under-stated, even to the extent of 20 per cent.; for instance, in a culvert of 100 inches diameter, such a discrepancy would not influence its dimensions to the extent of 7½ per cent., nor the cost of construction probably to the half of that per centage. In fact, practically, below the margin allowed by all careful engineers for contingencies that could not be estimated. And after reading and understanding the article, they would appreciate the sentence, "We must understand their motions, and their mode of secret, slow, but unceasing action, that our bridges, our wharfs, our dykes, may not become heaps of ruin. Ignorant how to proceed in these daily-recurring cases, how often do we see projects of high expectation and heavy expense fail of their object, leaving the state burdened with works not only useless, but frequently hurtful!"

This quotation derived peculiar significance from certain facts attending the publication of a pamphlet, proceeding from one of the recently appointed Metropolitan Commissioners of Sewers, and purporting to be a "Memorandum on the Data employed in Determining the Sizes and Estimating the Cost of the Works designed for the Main Drainage of the Metropolis," in which it was stated:—"De Prony's formula, applied to this latter class of cases, gives results which, as Claudel states ('*Formules*,' p. 110), deviate in some instances from the truth by no less than 29 per cent." But in reality, on reference to the authority there quoted, it appeared that no such passage existed, and the inference was entirely unsupported.

It was pointed out, that if several miles of huge sewers in the metropolis were constructed of too large dimensions, there might be an extra expenditure of 5 or 10 per cent., *but if, by the* adoption of empirical and incorrect formulæ, their dimensions were unduly restricted, the whole system might be a failure, and the expenses induced would be enormous.

On this point it was remarked, that the formulæ published by authority, and insisted on by the Board of Health, gave results differing very considerably from those of accepted practised experimenters, and men of admitted scientific attainments and mathematical knowledge; it would be desirable, therefore, to ascertain how and by whom these modern experiments had been made, in order to be assured as to the degree of credence to be accorded to the results.

It was thus elicited that the experiments referred to, although generally stated to have been made for the Metropolitan Commissioners of Sewers, and actually undertaken by a committee composed of gentlemen at that time forming part of the Commission, and the expense, amounting to upwards of £7,000, being paid from that office, yet that no complete records of the proceedings could be found in the archives of the Commission, nor had any official report been presented relative to the experiments, which had been chiefly made by a person who was not an engineer by profession, nor a man of scientific attainments, but who was a foreman or clerk of works on some small contracts for sewers. A careful examination of the details of the experiments showed, conclusively, *that they had been instituted and prosecuted by persons entirely ignorant of the science of hydraulics*, and, as a natural consequence, that the results were utterly worthless for all practical purposes, and moreover, that such as they were, they had evidently been tampered with and perverted, apparently with the object of fitting them to preconceived theories; thus the extensive circulation of deductions from these fallacious experiments had diffused error, and would, if persevered in, obstruct the progress of sound engineering in all matters connected with the drainage and supply of water to towns in this country.

In the course of the discussion it was further elicited that the formula which the author had employed was not the formula of Du Buat, nor was it applicable to the case of very low velocities, in which the adhesion of the water to the sides of the pipe would produce a very sensible retardative effect. The formula used was, in point of fact, a special modification of Eytelwein's formula, and did not comprehend in its terms this cause of resistance. Du Buat's formula, on the contrary, did include the resistance by adhesion, and also that of viscidity, and was of the following form, when reduced to English inches:

$$v = \frac{807\,(\sqrt{d} - 0{\cdot}1)}{\sqrt{s} - \mathrm{L}\sqrt{s + 1{\cdot}6}} - 0{\cdot}3\,(\sqrt{d} - 0{\cdot}1)$$

d being the hydraulic mean depth, s the denominator of the fraction expressing the slope or gradient, and L the hyperbolic logarithm of the quantity to which it was prefixed.

This formula gave values much more nearly approaching the results of the author's experiments, with minute heads and low velocities, than the formula employed by him; but it was less exact than the still more elaborate formula of Dr. Thomas Young, published in the Philosophical Transactions for 1808, which afforded correct results on pipes even so small as the $\frac{1}{3}$rd part of an inch in diameter, and with velocities of only one-fourth of an inch per second. This formula was of the form

$$v = a\frac{l}{d}v^2 + 2c\frac{l}{d}$$

in which a and c were exceedingly complicated functions of the diameter, each involving four, or five terms. For all practical purposes, however, the formula of Eytelwein, Prony, Poncelet, or Hawksley, might be used almost with indifference. The last-mentioned was the result of an independent investigation, had been frequently verified on a large scale, and in addition was better adapted for mental calculation in the practical operations of engineers. This formula was :—

$$\mathrm{V} = \tfrac{3}{4}\sqrt{\frac{h\,d}{\mathrm{L} + 1\tfrac{1}{2}\,d}}$$

$$\text{or more exactly} = {\cdot}77\sqrt{\frac{h\,d}{\mathrm{L} + 1\tfrac{1}{2}\,d}}$$

V being the velocity in yards per second, L the length in yards, h the active head in inches, d the diameter in inches, and the co-efficient $1\frac{1}{2}$ the divisor when L vanished into a tubulated orifice.

It was also shown, that the results of Mr. Leslie's experiments, instead of being at variance with received formulæ, were singularly consistent with, and confirmatory of those formulæ; and this whether as regarded pipes, orifices, sluices, or weirs.

The discharge by the Dundee Conduit differed scarcely at all from theory, while the discharge by the Edinburgh pipes fell short of theory, only just so much as was due to age and corrosion. So also the experiments through sluices and over notch-boards gave co-efficients almost identical with theory; therefore it was incumbent on the meeting, in returning thanks to the Author for his valuable contribution, to request that he would undertake to revise the tables of co-efficients, and then to bring the subject again under the notice of the Institution.

Great importance was attached to the communication, at the present juncture, in consequence of the repeated attacks which had been made by certain public Boards and unlearned members of local bodies, on the present advanced state of hydraulic science, with the view of carrying out visionary schemes of their own creation, or of arresting proposed improvements of vast importance to the community. Particular attention was drawn to the very inaccurate experiments, and still more inaccurate conclusions of the Trial Works Committee of the late Metropolitan Commissioners of Sewers, used and extensively promulgated by the late General Board of Health, which, it was feared, coming, as they did, from a Government authority, were not even yet sufficiently eradicated from the public mind; and also to the evil consequences which had resulted, and still continued to result, from the suspension of the drainage of the Metropolis, while successive Boards of Commissioners appointed by Government, were debating amongst themselves trivial questions, as to whether this, or that formula should be used in the calculations of their engineer, or whether water would run faster through a cylinder made of one kind of material, or of another kind of material. In these respects Mr. Leslie's experiments were most valuable, because they confimed the conclusions of all practically scientific men, that the accepted formulæ sufficiently well represented actual results, and that the velocity of water was the same, whatever were the materials over which it happened to flow.

On behalf of the Author of the Paper, it was remarked, with respect to the alleged discrepancies in the second series of experiments, that instead of impugning the results, they rather proved the honesty of the records, and demonstrated their useful character, whilst they pointed out the difficulties to be encountered in making accurate hydraulic experiments, and where failures might be anticipated in their application to engineering practice.

In reference to the formula commonly used for the discharge of pipes, it was contended, that the rules adopted by Prony, Eytelwein, Poncelet, and others, were all substantially the same, varying only in the constant for friction, 45·5 being the lowest, and 50· the highest constant for feet per second, now more commonly used and referred to as Du Buat's in the Author's Paper; but it was further contended, that

the formula of Du Buat provided for the varying diameter of pipes, and also for the reduction of discharge by the loss of head required for overcoming friction, at flat rates of inclination, in a manner similar to, but much more complicated, than the plan proposed in the paper.

The conclusions of Du Buat and of Bossut, a previous writer, were founded on experiments detailed in a scientific paper by M. Couplet, the engineer of the Versailles water-works, in the year 1732; and those experiments were confirmed in a remarkable manner by the large practical conclusions given in the Author's Paper.

It was maintained, that the conclusions of all mathematical writers of the present century were based on the formula of Du Buat; that Prony, Eytelwein, Poncelet, Robison and the elder Leslie, as well as the engineers of the present day, had all agreed in practice, in omitting the more complicated part of Du Buat's formula; in verification of this, a table was given, showing comparisons of the French experiments from 1732, down to those recently made by the Author, and exhibiting the most striking coincidences, of theory with practice; the variations for practical purposes in the different rules being small, and the correction proposed by the Author affording an excellent application of the principles adopted by Du Buat, for providing the most ample allowance in extreme cases, such as all engineers must meet with in hydraulic operations.

BETHUNE'S IMPROVEMENTS IN STEAM NAVIGATION.

To the Editor of the Mechanics' Magazine.

Sir,—A friend having this day put into my hand your Magazine of the 3rd instant, containing an article, signed "J. C.," condemning, in no measured terms, my article upon "Improvements in Steam Navigation," which appeared in the *Journal of the Society of Arts*, I beg to solicit space in your valuable Magazine to reply to an attack full of bitterness and injustice.

It is generally observable, that what is wanting in argument or proof, in attacks of the nature of that by "J. C." is made up by bold assertion and reckless vituperation; and instead of showing the defects of my plan of constructing iron steamers which shall have a "guaranteed speed of 17 knots an hour," "J. C." contents himself with expressing his own opinion upon the subject, and with the remark, "I wonder who the prudent builder is who would undertake such a contract."

Let me inform "J. C." that there is not only one eminent ship-building firm who will enter into "such a contract," but two at least; and for his information, I take the liberty of giving an extract from the letter of one of those firms, which may not be uninteresting to your readers generally, as well as to "J. C."

Alluding to a steamer upon my plan, for river navigation, and which shall have strength and *stability* sufficient to cross the Atlantic in summer, they say, "We will build you a steamer (giving the dimensions, &c.), guaranteeing her speed at *twenty-five* miles an hour; failing which, we will return any money paid to account, with interest, and keep the boat. And we consider a steamer similar to what you propose (with alterations in dimensions, scantling, and power) will steam across the Atlantic in ordinary weather in *seven days*, and be perfectly safe and seaworthy." This steamer is to have state-rooms for 200 cabin passengers, and to carry at least 500 deck passengers and 80 tons of merchandise, and be perfectly stiff.

As such a speed as is here guaranteed has never been attained in this country, I presume the candid reader will say, that if my plan can produce such results, it must be far in advance of any that has yet been adopted. That it can produce those results, an eminent and responsible ship-building firm offer their guarantee.

Another eminent ship-building firm, speaking of an ocean steamer upon my plan, say, "We shall have no difficulty in accomplishing the speed you anticipate, viz., 18 knots or 21 miles an hour; indeed the results already obtained by the *Banshee*—18¼ miles per hour—were *more* difficult of accomplishment than 18 knots or 21 miles an hour will be with yours; the form and dimensions in your case being so far preferable. There is, in fact, *no doubt* of the mechanical result at all."

It is very easy to assert that a vessel upon my plan will have greater depth than ordinary vessels; but the truth is, that it will be fully one-third less, except at the centre, and there it will not exceed the depth of long steamers. Cannot "J. C.,' discover that by diminishing the depth forward and aft, and placing the strength of the ship in the right place—the present form of building vessels being the weakest imaginable—great weight of material is saved? Cannot he discover that less weight of material and greater length will have the effect of diminishing the draught of water? Cannot he imagine that the models in general use at present need not be adopted? and that another may be adopted which shall lessen the draught of water, while it gives lines far superior to those of any steamer afloat?

Allow me to give an extract from a letter of a well-known captain, and who has had very great experience in the sailing and construction of some of the best steamers in the kingdom: "I have no hesitation in stating that the model and lines of a vessel you showed me are the very thing that is required to ensure great speed and comfort." "Your plan would make the route such vessels are placed on preferable to any other. I have often thought of the plan of *fastening* you propose, and am *satisfied of the strength.*"

Here, then, we have on one side the opinions of practical men who have seen my plan, approving of it in the strongest manner; and on the other we have the assertion of a nameless writer, of whose experience we have no knowledge, and who has not seen my models and drawings. Which are entitled to the greatest consideration, I shall not stop to inquire. It must be borne in mind, that my patent is not for improved lines, but for an improved mode of fastening or strengthening steam ships, which enable me to improve their shape and speed. The public will, I apprehend, hardly think those improvements "intrinsically worthless" which have the approval of men of great practical ability, and who are willing to back their opinion by a *guarantee* such as they have named. As my connection with steamers dates back to the year 1830, and has continued to the present time, having been the owner of nearly a dozen, it is probable I can boast of an experience at least equal to that of your correspondent, "J. C." Let me hope that he will at least have the candour to admit that his opinions of the value of an improvement approved by eminent practical men, and whose letters can be seen at any time by persons desirous of availing themselves of the improvement, may be wrong, and that he may have inflicted an injury by a hasty and unjust criticism which he must regret.

I am, Sir, yours, &c.,

D. Bethune.

London, Feb. 15, 1855.

TUBULAR STEAM BOILERS.

To the Editor of the Mechanics' Magazine.

Sir,—I think that in Mr. Wright's paper, on "Tubular Steam Boilers," at page 77, in your Magazine, there are one or two mistakes; such as, "The vapour containing the heat may be carried too quickly over the heating surface," and that this "appears to have been overlooked in the first constructed tubular boilers."

Mr. W. forgets that speed was and is given to the heated vapour, or to the draught, to intensify the heat. It will be found that by continuing to pass the finger through a flame, an increase of temperature is gradually experienced, till the heat of the flame is fully attained; no matter what the speed is at which the finger moves. This experiment is the best argument in disproof of Mr. W.'s suggestion, that "it might, perhaps, be possible to convey vapour containing a considerable amount of heat so rapidly over a surface as that no perceptible heat should be transferred."

In his example of a boiler requiring 100 feet heating surface, with long or short tubes, he overlooks the laws of the motion of fluids; from what follows, I should say he means that if long tubes are used, there would be eight of 3-inch diameter, and 16 feet long; and if short ones, say 8 feet long, twelve tubes, with double the area of opening. In the latter, and not in his supposed case, would the velocity of the heated vapour in the long tubes be double that in the short ones, as the velocity of fluids is inversely as the area of the orifices. With regard to the loosening of the tubes, I would inquire, who could be surprised at it, when the tube, the plate, and the ferrule are composed of three different materials, all of different rates of expansion by heat?

I am, Sir, yours, &c.,

Y.

ON THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

Sir,—Having, in my last, explained what I considered as misapprehensions on the part of Mr. Baddeley, I have now to notice another, and for which I can only account by, perhaps, his not considering my letter as requiring a more attentive reading.

Mr. Baddeley has quoted several passages from my published treatise on the Combustion of Coal, in which I relied on the identity in principle and effect between my mode of introducing *air to the gas* generated in a furnace, and that of introducing the *gas to the air* in the Argand gas-burner. Mr. Baddeley then observes—"Why Mr. Williams is *now* so desirous of ignoring the name of *Argand*, after so long and exclusive use, I cannot imagine." *Where* it is that I have ignored the name of "Argand," or have thus said the reverse of what I mean, I cannot discover. Certainly not in the letter referred to by Mr. Baddeley. So far, indeed, from doing so, every word I have written shows my claim to rest on this: that I saw, and reduced to practice, on the large scale of the furnace, the principle which makes the so-called *Argand gas-burner* effective on the small scale of the lamp.

Mr. Baddeley must have overlooked the meaning of the passage in my letter, which he has quoted, seeing that he has given but one-half the short sentence, omitting the other half, and to which my objection referred; for I do not suspect him of having intentionally misquoted or garbled. The passage was as follows, the words in Italics being those omitted by Mr. Baddeley:

"Mr. Baddeley observes, Mr. Williams has admitted the principle of perforated air-distributors had originated with Mr. Argand, *who applied that principle to the well-known lamp that bears his name.*" I then went on to say—"I have made no such admission, as Argand did not apply that principle to the lamp. In truth, he made no attempt of the kind."

I here then repeat, that so far from making such an admission, I distinctly deny either that "the principle of the perforated *air-distributors* originated with Mr. Argand," or that "he applied that principle to the lamp that bears his name." In truth, the very use of gas was unknown when Argand invented his oil-lamp; and I claim, therefore, to be the first that applied the principle, not of the Argand oil-lamp, but of the Argand gas-burner, to the purposes of the furnace or the introduction of the air. The principle and invention of Argand was applied to the use of oil. This is well explained by Pecksten in his "Treatise on Gas," and is here worth quoting, the more so as it bears directly on the smoke question, and exposes the error of the "smoke-burners."

"When the circumstances," observes Pecksten, "under which combustion of inflammable matter is carried on, are favourable, the flame is perfect and brilliant. On the contrary, should the combustion be incomplete, part of the matter (the carbon), capable of furnishing light and heat, *will pass off in smoke*: hence, whenever much soot is found, we may conclude the body producing it has not been used to the greatest advantage. The necessity of a *proper supply* of air for supporting combustion to advantage, suggested the idea of the *Argand lamp*, the ingenious inventor of which proceeded on two principles. First, to increase, to the greatest extent, the surface of the wick; secondly, to increase *the quantity* of air applied to it, and in this way, to produce the combustion of all the material (oil) absorbed. It is well known that the wick in the Argand lamp is thin and circular. By this arrangement the whole of the matter that can be burnt is consumed in consequence of the wick being spread through a large surface, and a current of air produced by the glass chimney being applied both to the inside, and the outside of this wick."

Here, the principle of Argand's oil lamp is clearly stated, and its effect in increasing the quantity of air is also shown. This, however, has no relation to the principle of the "air distributors," that principle being, *not* the *increasing the quantity* of air introduced, but *the mode* of introducing that quantity, and by which means heat and flame are instantaneously created; whereas, on the contrary, a cooling is produced by admitting the same quantity of air in masses, or large streams.

Pecksten then continues: "As the Argand (oil) lamp, from which the idea of the Argand (gas) burner was evidently taken (he does not say by whom), is superior in effect, so also great advantage arises from burning gas upon a similar principle," *in the lamp.*

So far, then, from ignoring the name of Argand, I say its application to the furnace was not only correct, but extremely judicious and useful, as it brings at once into view the principle on which it acts, namely, the bringing *the air and the gas* together and into atomic contact so rapidly, as to produce the great desideratum—immediate mixture and diffusion between their respective particles.

Mr. Baddeley thinks it extraordinary that I should disclaim having "given the name of *Argand* to my mode of introducing the air." It would, however, have been more extraordinary had I claimed that which did not belong to me. That most appropriate name was given by another gentleman, and has since been generally received and applied to the principle adopted by me. The use of the term by Dr. Ure is evidence of the fact. I may repeat, that Mr. Baddeley's mistake has arisen from his hasty reading my letter, seeing that he has overlooked the other fact of my having, instead of ignoring the name, pointedly used it in the very quotation I made from Professor Brande, and which he has alluded to. That quotation was as follows: "Each jet of air which you admit becomes, at once, the source and centre of a separate flame; and the effect is exactly that of so many jets of inflammable gas ignited in the air [*as in the Argand burner*], only you invert this ordinary state of things." Mr. Baddeley appears to have overlooked the circumstance of the words there given in italics being mine, and being placed between brackets, indicating that they are my words, and not those of Professor Brande: thus showing rather my adherence to the name, Argand, than ignoring it. I trust Mr. Baddeley will now do me the justice to believe, that I could not be so inconsistent as to ignore the very term which I rely on, as being suggestive of the principle on which my mode of intro-

ducing the air operates as a preventive of the smoke nuisance.

I am, Sir, yours, &c.,
C. W. WILLIAMS.

Liverpool, Feb. 19, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—You have a clever but pragmatical correspondent, who seems determined to allow no one to differ from his ideas on smoke and combustion.

He insists that smoke is not combustible, and yet a child who has only read "Pinnock's Chemical Catechism," could inform him that the *visible* gaseous products of an ordinary fire (mostly the vapour of tar), which really and truly constitute smoke, *proprement dit*, are wholly and entirely combustible in a practical sense.

Again, your correspondent pooh-poohs the idea of employing heated air to facilitate the ignition of the *smoky* products of combustion; but inflammable gases require a certain degree of temperature to insure their ignition, and it is evident that if such gases are exactly at the temperature required to inflame, the introduction of cold air would necessarily lower the temperature of the mixture below the point of ignition, and no combustion would take place. The flame of a candle (which, by-the-bye, is nothing but a pyramid of burning smoke) may be almost extinguished by supplying it with intensely cold air, while a heated atmosphere increases the calorific effect of burning bodies, exactly in proportion to the number of units of heat brought to the combustible by the heated air.

Very positive people can only be replied to in a positive manner; therefore, pray tell your correspondent, that smoke, *i. e.* the *visible* emanations of a coal fire, is combustible, and that a fire, supplied with hot air, does produce a greater calorific effect than when the same fire is supplied with cold air, the increased effect being due to the quantity of caloric previously imparted to the air.

I am, Sir, yours, &c.,
G. H. PALMER.

Marseilles, Feb. 17, 1855.

P.S.—It may interest some of your readers to learn, that at a sugar refinery in this town, there are eight steam boilers, of the collective force of 400 horses, the furnaces of which have been provided, for *three or four years*, with Juckes's revolving grates. They are completely successful, there is no smoke, and small coal is now used where large was formerly necessary, the saving in the *value* of the fuel being nearly one-half.

MR. C. WYE WILLIAMS ON COMBUSTION.

To the Editor of the Mechanics' Magazine.

SIR,—I am sure Mr. Williams must have overlooked my letters appealing to his good faith and sense of justice. He has himself thrown too much light on the economy of combustion to be likely to act the obstructive, or attempt to obscure any man's candle. Standing, as this nation now does, under a crushing, weight of agony from the results of obstructiveness, favouritism, and vested interests, the universal feeling throughout the land resembles that of the condemned at their last shift, anxious to make atonement by confessing all their accidents of omission or commission. Mr. Williams's position, as the father of ocean steam navigation—for I believe it was under his auspices that the now trifling distance across the Irish Channel was first conquered by steam power—raises him entirely independent over that fear of giving offence in witnessing the truth, by which subordinates are sometimes painfully constrained to succumb; and as to any reluctance in publicly correcting a misapprehension which any one might have made, this feeling does not enter into philosophic minds,—to them the pleasure of promoting valuable truth and redeeming a pledge surpasses every other consideration.

I am, yours, &c.,
DAVID MUSHET.

P.S.—We see by the *Times* last week that Mr. Nasmyth's wrought-iron cannon, after his being at considerable expense, are stopped *in limine*, put in limbo, actually suspended, like Mahomet's coffin, between the Ordnance and the Admiralty. Never was there a time when every man should more lend the utmost efforts of his shoulder to the wheel of improvement.

Feb. 14, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

FRANKHAM, SAMUEL, of Greenland-place, Judd-street, Middlesex, engineer. *An improvement in the construction of furnaces.* Patent dated July 27, 1854. (No. 1657.)

Claim.—Applying to steam-boiler furnaces hollow fire-doors, constituting a supplementary steam generator in connection with the main steam boiler.

JENKS, BARTON H., of Bridesburg, Pennsylvania, United States, manufacturer. *Improving the art of weaving, being an improvement in looms for weaving fancy fabrics.* Patent dated July 27, 1854. (No. 1658.)

Claims—1. The use of a spiral cam in combination with a shifting clutch and

lever for raising and lowering alternately, or holding stationary, a two-shelf shuttle-box. 2. A method of rendering a pattern or pin-wheel capable of working larger patterns than heretofore, without increasing its size, by means of a multiplier. 3. A series of shuttle-boxes, independent of the cheeks of the lay, and constructed of mere shelves connected together by upright bars, which serve also as guides, or in any other convenient manner so that it is a mere skeleton or frame, whereby the weight of the moving parts of the series of boxes is materially reduced, and the changes can therefore be safely made with greater rapidity than heretofore, and the speed of the loom be correspondingly increased, &c.

WICKENS, HENRY, of Tokenhouse-yard, London, solicitor. *Improvements in the means of giving signals on railways, and for other purposes.* Patent dated July 27, 1854. (No. 1659.)

The inventor proposes to form a line of communication between the carriages of a train by means of a tube, which extends from a cylinder placed at one part of the train to another situated at any other part, and connected with a whistle or other signalling instrument.

LAW, ALEXANDER, of Glasgow, Lanark, iron-founder. *Improvements in cranes, or lifting and lowering apparatus.* Patent dated July 27, 1854. (No. 1661.)

This invention relates to various modifications of safety contrivances to be applied to that description of movable derrick or jib-cranes on which the barrel of the chain for hoisting or shifting the jib is driven in connection with the barrel of the main hoisting chain or tackle. In one modification of this class of crane the spindles of the two hoisting barrels carry spur-wheels, and one drives the other by means of an intermediate pinion. This intermediate pinion is carried on a stud-pin in the crane framing: and ordinary cranes are so arranged, that when it is necessary to work the main hoist independently of the jib-hoist, the pinion is shifted on its stud out of gear with the spur-wheels of the two barrels, whilst the jib is prevented from falling by a pall or detent, which is turned over by hand and made to take into the teeth of the spur-wheel on the hoisting-barrel spindle.

THOMPSON, ROBERT HENRY, of Old Charlton, Kent, engineer. *A universal self-acting sawing machine.* Patent dated July 28, 1854. (No. 1664.)

This invention consists—1. In obtaining from the reciprocating motion of the saw-frame any desired motion of the saw itself during the process of cutting, so that the saws may travel across the frame or gate, and may also be partially turned round; and, if required, turned entirely round, and thus cut backwards, or during the back motion of the timber. 2. In obtaining any desired side motion or cant of the canting-roll which supports the timber, and of the dogs which carry the ends of the timber, in order to present the upper surface of the wood at any angular position with respect to the saws. We shall, probably, give an illustrated description of this invention hereafter.

JOHNSON, RICHARD, of Manchester, Lancaster, wire manufacturer. *Improvements in coating and insulating wire.* Patent dated July 28, 1854. (No. 1665.)

Claim.—Coating or covering wire with solutions of gutta percha, caoutchouc, tar, pitch, asphaltum, resin, or wax, in coal naphtha, or in any other suitable fluid.

MORTON, FRANCIS, of Liverpool, Lancaster, engineer and contractor. *Certain improvements applicable to girders or rafters to be used in the construction of roofs, bridges, buildings, and other erections.* Patent dated July 28, 1854. (No. 1666.)

This invention consists in constructing girders or rafters of main centre pieces, which are made to abut end for end against each other, and are strengthened and held in their relative positions by side pieces or plates so as to form one rigid girder or rafter.

PETIT, AMABLE HIPPOLYTE, of Paris, France, gentleman. *An improved mode of joining pipes.* Patent dated July 28, 1854. (No. 1667.)

This invention consists in forming a joint for pipes or tubes by means of a washer of an elastic or compressible material, enclosed and tightly held between the joints by an arrangement of lugs.

GILBERTSON, JAMES, of Hertford, Herts. *An improvement in supplying air above the fuel in furnaces.* Patent dated July 28, 1854. (No. 1669.)

This invention consists in applying a perforated air-tube over the fuel or on the two sides of the furnace, extending from the front to or beyond the bridge, so that the air may be heated in passing through it.

KEEN, ROBERT JOHN, of Liverpool, Lancaster, nautical and optical instrument maker. *Improvements in the mariner's compass.* Patent dated July 29, 1854. (No. 1670.)

Claims.—1. The employment of washers of bone or ivory in the adaptation of an India-rubber disc-spring to the cap of the compass, for the purpose of preserving the India-rubber from the corrosive effect consequent on contact with metal. 2. The adaptation of a double action metallic spring, or its equivalent, to the centre on

which the compass-card is supported, so as to obtain a spring-bearing for the compass-card. 3. The adaptation of metallic springs, or their equivalent, to the pivots and shoulders of the compass.

BURKE, EDMUND, of Upper Thames-street, London, gentleman, and ALEXANDER SOUTHWOOD STOCKER, of the Poultry, London, manufacturer. *Certain improvements in the manufacture of metallic tubes and such like articles.* Patent dated July 29, 1854. (No. 1672.)

Claims.—1. The application of a thin sheet of metal coiled or lapped around a suitable core, mandril, or mould, to produce a tube or other hollow article. 2. Forming one layer or series over another continuously and in close contact, without welding the edges of the plate or sheet together, for the purpose of producing a light and strong tube or other article. 3. Galvanizing or immersing in molten metal, for the purpose of soldering together, massing, or consolidating articles made as above.

BORLAND, JOHN YUIL, of Manchester, Lancaster, machinist. *Improvements in machinery for preparing and spinning fibrous materials.* Patent dated July 29, 1854. (No. 1676.)

The chief peculiarity of this invention, in respect to the parts immediately operating to effect the twisting and winding up of the thread or sliver, consists in the arrangement of a peculiarly-formed tube, mounted in independent bearings, and having a revolving motion given to it, to put in the required amount of twist in the sliver or thread which passes through it, in combination with a spindle having its axis also in independent bearings in a line corresponding with the axis of the tube, into the interior of which the end of the spindle can enter.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *An improved method of engraving.* (A communication.) Patent dated July 29, 1854. (No. 1679.)

"This invention consists in producing engravings of all kinds in relievo, by a galvanic current, the plate or metallic object desired to be engraved being covered with the design in some suitable ink, and substituted for the soluble or feeding electrode usually employed in any pile whatever."

DIXON, EDWYN JOHN JEFFERY, of Bangor. *Improvements in apparatus for teaching reading and arithmetic.* Patent dated July 29, 1854. (No. 1680.)

The inventor employs "alphabet bands," which are led over pulleys, like the driving-bands of machinery, along the front of the apparatus, and are worked by levers acting on ratchet or other contrivances, and arranged like the keys of a cabinet pianoforte, or in any other convenient manner.

WALDUCK, HENRY, of Warwick-court, Gray's-inn. *Improvements in propelling vessels.* Patent dated July 29, 1854. (No. 1681.)

Claim.—The construction of the blades of propellers with grooves on the propelling surfaces.

DEMAY, JEAN CHRILOTTOME DENIS, of Leicester-square, London, acting for Antoine Charles Cardot, a mechanician engineer, in Paris, France. *Preventing the accidents on the railways with the aid of a right line of iron, and in stopping the trains almost instantaneously.* (A communication.) Patent dated July 31, 1854. (No. 1683.)

The inventor proposes to employ an arrangement of levers and a peculiar system of clockwork-gearing for working railway-brakes.

ADAMS, HENRY, of Leonidas-terrace, New Cross, Deptford, Surrey. *A revolving ventilator.* Patent dated July 31, 1854. (No. 1684.)

The inventor employs rotating fans, contained between discs and enclosed in cases in such manner that an in-draught is produced on one side and an out-draught on the other without producing any "draught direct."

GREEN, JOSEPH, and WILLIAM JACKSON, both of Leeds, York, machinists. *Improvements in mortising-machines.* Patent dated July 31, 1854. (No. 1686.)

This invention consists in the application to mortising-machines of a hollow rack, or its equivalent, through which the spindle of the cutting tool passes, for raising and lowering the cutting tool, in place of the spindle generally used for that purpose, which has teeth all round it.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved mode of extracting sulphur from compounds of India-rubber and sulphur.* (A communication.) Patent dated July 31, 1854. (No. 1687.)

The inventor cuts the vulcanized India-rubber into small pieces, and soaks it in camphine till it becomes soft; he then further treats it with camphine, to which is added from fifteen to twenty-five per cent. of sulphuric ether, and about five per cent. of alcohol.

BRIDSON, THOMAS RIDGWAY, of Bolton-le-Moors, Lancaster, bleacher. *Improvements in preparing cotton for manufacturing purposes.* Patent dated July 31, 1854. (No. 1688.)

This invention consists in improving the colour of cotton while in certain stages of manufacture, by bleaching; and, when requisite, in submitting the cotton to the

action of a soap bath, in order to render the fibres more fit for undergoing the subsequent operations of preparing and spinning.

GILLMAN, EDWARD, of Twickenham, Middlesex, gentleman. *Improvements in the manufacture of papier maché and other similar articles from certain vegetable substances.* Patent dated August 1, 1854. (No. 1689.)

This invention consists in the employment and peculiar treatment of the leaves or fibrous portions of New Zealand flax, the running or creeping plant called giagia, and the species of dracaena called ti, for the production of pulp for the manufacture of paper, papier maché, &c.

READ, CHRISTOPHER RIDOUT, of Moorgate-street, London. *Improvements in slide-valves of steam engines.* (A communication.) Patent dated August 1, 1854. (No. 1692.)

The inventor arranges his slide-valve in such manner, that when an opening in a hollow-face plate at the back of the slide-valve corresponds with one of the openings in the back of the valve, the other opening into the valve is fully open to receive steam from a valve-box, and consequently, the steam from the latter will be passing into the valve through the face-plate, and at the same time, into the valve direct from the slide-box.

MCGAFFIN, JOHN, of Liverpool, Lancaster. *An improvement in the manufacture of sheet-metal pipes.* Patent dated August 1, 1854. (No. 1693.)

This invention consists in manufacturing sheet-metal pipes of corrugated sheet metal, and by preference of sheet iron coated with zinc.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improvements in the construction of repeating fire-arms.* (A communication.) Patent dated August 1, 1854. (No. 1694.)

This invention consists—1. In supplying a reserve of motive power, so that the fire-arm may be discharged two or more times successively; and, 2. In causing the explosion of the caps or other percussion priming by the rotary motion of the breech cylinder, which is made to perform the function of the ordinary hammer or cock. 3. In the application to repeating fire-arms of an escapement or escapements for the purpose of exhausting the store of power obtained for the purpose of discharging them.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent-agent. *Improvements in machinery for dressing flax, hemp, and other like fibrous substances.* (A communication.) Patent dated August 1, 1854. (No. 1695.)

Claims.—1. The construction and arrangement of heckling and scutching-drums, or of drums having a series of heckling-bars, armed with teeth and set at an angle with the radius, in combination with blunt-edged scutching bars, these drums being arranged in two rows, one above the other, with the centres of their shafts placed diagonally, so as to cause the flax, in passing between them, to be acted upon by both sets of drums. 2. Combining the shafts of all the drums with the main driving power by pulleys or wheels of different sizes, so graduated as to cause each successive drum to revolve with greater velocity than the preceding one, commencing from the feed place, whereby the flax is stretched or drawn inward with a certain tension, and is thus made to receive a greater mechanical action from the drums.

MERRITT, THOMAS EDWARD, of Maidstone, Kent, drawing-master. *Improvements in apparatus for taking photographic pictures in the open air.* Patent dated August 1, 1854. (No. 1696.)

This invention consists in adding to a camera a dark chamber, intended to contain prepared papers or glasses, and a box or tray to contain the photographic pictures until they can be conveniently developed, so that the ordinary screen, which completely envelopes the head of the operator, may be dispensed with, and a number of pictures taken in succession; in constructing a spring frame for holding the prepared plates of glass used in the collodion process, and in the use of a closed box for containing prepared papers and glasses to be used in the open air.

HOLLAND, JOHN SIMON, of Woolwich, Kent, engineer. *Improvements in locks.* Patent dated August 1, 1854. (No. 1697.)

These improvements consist—1. In making the key of the lock and the tumblers stationary during the motion of the bolt. 2. In making the key of a number of separate pieces in the shape of pins or small plates, each tumbler to rest on a separate pin or plate during the motion of the bolt. 3. In making a curtain or plate to be moved round by the key, and to move the bolt, instead of the key coming in contact with the bolt. 4. In making a stopper to prevent the key making more than one revolution in the same direction, and thus stop the key at the point for its coming out of the key-hole. 5. In making a fixed or removable obstacle to prevent the key being brought round to the key-hole, and withdrawn when the bolt is not out or locked. 6. In making locks intended to be acted on from both sides to have two separate key-holes, and the key to act upon different parts on the two sides. 7. In making the back end or ends of the bolt or bolts to pass through the case of the lock, or into a separate case of the same size as the locking ends, and thus preventing an amount of air equal in bulk

to the ends of the bolts being forced into the interior of the lock when the bolt is shot, which air might introduce a quantity of dust. 8. In making the bolt or bolts pass into a recess, formed partly by the lock or door, and partly by the jamb or side of the chest or safe, so as to render it necessary to shear the end or ends of the bolt or bolts longitudinally, before the door could be forced by violence being used to destroy the bolt. 9. In making the bolts lock into shelves having suitable staples, hooks, or tongues to receive a suitable part of the bolts to lock into them at the back or sides of the lock. 10. In a mode of making the key of the lock in separate pieces or steps. 11. In fitting a certain case to the key of the lock. 12. In making a hole or holes in the key - pipe, through which the air and any dust may pass when the key-pipe is thrust on the key-pin. 13. In making the key of the lock with a bit at each end, instead of a bit at one end, and a bow at the other, where the key is to be used on both sides of the lock, one end to serve for one side, and the other end for the other side. 14. In rounding or bevelling off the outside of the key-hole, or making radiating grooves, or both, so as to render it more difficult to injure the lock by gunpowder, by means of a plate or board fixed against the key-hole, and also to render it more difficult to take an impression of the key-hole. 15. In making a rabbet or tongue, pin or pins, to go from the lock (or door to which the lock is fixed) into holes or recesses in the chest, safe, or jamb, in order to prevent an opening being made by force so as to get at the outer end of the bolt of the lock. 16. In rounding or bevelling the edge of the front part of the lock or door and the side to which it locks, in order to prevent instruments being used to make an opening to get at the bolt. 17. In making a latch in such manner that, when set for the purpose, the tumblers are right for the bolt being moved without the key. 18. In making rabbets or tongues on the upper and lower parts of the case of the lock, so as to give increased strength for fastening into the wood-work of a door when used as a mortice lock. 19. In making an elastic or flexible packing to go round the ends of the bolts, and also round the key-hole, and round the front of the lock or door, to exclude dust, wet, or dampness from the interior of the lock. 20. In making a hook on the outside of the lock, with or without a recess in the end, into which the bolt is shot when locked, so as to adapt it to be used as a padlock. 21. In making a hole or holes through or near the bottom of the lock when used as a padlock, in order to let out any water that may find its way in.

Griffiths, James, of Wickham-market, Suffolk, gentleman. *A new or improved lever bit for horses.* Patent dated August 2, 1854. (No. 1698.)

This invention consists in the construction of a bit for horses in which levers are made to turn on the cheeks of the ordinary bit, the lower parts of these levers being attached to the pivot ends of the port or mouth piece of the bit, and the upper ends connected together by means of a solid or chain curb.

Lees, Samuel, of Salford, Lancaster, manufacturing chemist. *Improvements in machinery or apparatus to be used in purifying gas for illumination.* Patent dated August 2, 1854. (No. 1699.)

This invention consists in agitating or giving motion to the dry lime used in the purification of gas for illumination, either by causing it to be deposited in a trough in which a screw or worm revolves, and through which the gas is conducted, or by other suitable arrangements of apparatus.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Varley, Samuel, of Stamford, Lincoln, engineer. *Improvements in the construction of reaping - machinery.* Application dated July 27, 1854. (No. 1655.)

The inventor employs lozenge - shaped cutters, which severally rock on a centre-pin, and are connected by links or rods at their inner ends to a common reciprocating bar. These cutters are pressed up to fixed serrated blades by springs bearing against their under surfaces, &c.

Shorrocks, William, of Farnworth, Lancaster, spindle and fly - manufacturer. *Improvements in presser-flyers for preparing cotton and other fibrous substances for spinning.* Application dated July 27, 1854. (No. 1656.)

This invention consists in a method of employing a spring for the purpose of causing the presser-finger or fingers to bear against the bobbin; and in so constructing the springs employed for that purpose that they shall be capable of keeping the presser-fingers outward when moved beyond a certain point, so as to facilitate the operation of doffing.

Miller, Nathaniel, of Guide-bridge, Lancaster, railway-inspector, and Robert Graham, of the same place, overlooker. *Certain improvements in the construction of certain parts of the permanent way of railways, commonly called crossings.* Application dated July 27, 1854. (No. 1660.)

The inventors propose " to employ a solid block or crossing-piece of metal, tapered as required, and bolted at its apex to its side-

rails, with an intervening space occupied by small blocks or wedges (placed below the rim of the wheel-tyre) preserving the proper space between the rails and centre block."

SCOTT, GEORGE LAMB, of Manchester, moulder, and SAMUEL BENNETT, of Manchester, brass-founder and coppersmith. *Improvements in springs for pressing together rollers for mangling and other purposes.* Application dated July 28, 1854. (No. 1662.)

These improvements consist in producing the requisite pressure upon the rollers named in the title, by means of springs of vulcanized India-rubber or other suitable elastic material.

GUILD, ADAM, of Salford, Lancaster, engineer, and JOHN PENDLEBURY the younger, of Manchester, in the same county, bleacher. *Improvements in apparatus for scouring or bleaching.* Application dated July 28, 1854. (No. 1663.)

The chief features of these improvements are, that the scouring liquid is heated in a vessel distinct from the bowking kier, but connected therewith by a pipe leading from the top of the vessel to the upper end of the kier, and another from the lower end of the kier to the bottom of the vessel.

CLIFT, SAMUEL, of Manchester, manufacturing chemist. *Improvements in making paper, pasteboard, and papier-maché.* Application dated July 28, 1854. (No. 1668.)

The inventor steeps in a solution of potash, soda, or ammonia, green grass, nettles, or hay that has not been too much heated in the rick, preparatory to converting them into paper, &c.

SMITH, WILLIAM HENRY, of Bloomsbury, Middlesex, civil engineer. *Certain improvements in the permanent way of railways.* Application dated July 29, 1854. (No. 1674.)

This invention consists in the use of a railway chair, formed in two parts, adapted to each other so as to form a kind of joint, the pressure of the rail with the superincumbent weight causing the jaws or upper parts of the chair to clip the rail firmly between them, &c.

COLLASSON, GUSTAVE EMILE BERNARD, gentleman, of Paris, France. *Certain improvements in the means for arresting or checking the progress of trains on railways.* (A communication.) Application dated July 29, 1854. (No. 1675.)

The inventor works the brakes of railway carriages by means of steam cylinders attached to each brake carriage, and connected with each other by means of flexible or jointed pipes

FAWCETT, JOHN, of Gateshead, Durham, chemist. *An apparatus for regulating and economizing the consumption of gas generally, but more particularly when employed for the purposes of illumination.* Application dated July 29, 1854. (No. 1677.)

This invention consists in regulating the gas at the burner, by means of a supplementary cock, and in so constructing the burner that when it is adjusted it can only be altered by a suitable instrument; an index is attached to the burner for the purpose of ascertaining whether the apparatus has been tampered with.

INGALL, GEORGE HENRY, of Warnford-court, Throgmorton-street, Middlesex, gentleman. *Improvements in elastic bands for holding books and papers.* Application dated July 29, 1854. (No. 1678.)

The inventor forms a band of elastic webbing, or other suitable elastic material, with a coupling piece by means of which the length of the band may be varied.

THATCHER, GEORGE, of Welton, Midsomer Norton, Somerset. *Improvements in the manufacture of woven fabrics, yarn, cordage, ropes, paper, and pasteboard, by the application of a material not hitherto used for such purposes.* Application dated July 29, 1854. (No. 1682.)

This invention consists in employing the fibres of the leaves of horse-radish, in the place of hemp and flax, in the manufacture of woven fabrics, &c.

GREEN, HENRY, of Liverpool, Lancaster, whitesmith and ironmonger. *Improved apparatus applicable to the hanging of doors, gates, and windows, and for closing or holding open the same when required.* Application dated July 31, 1854. (No. 1685.)

In applying this invention, the doors, windows, or gates are mounted on gudgeons or pivots, combined with a certain friction-roller, which works upon and against an inclined plane, formed on the end of a weighted lever.

BOUNEAU, JULES FREDERIC, of Paris, France. *Improvements in propelling ships.* Application dated August 1, 1854. (No. 1690.)

The inventor places on each side of the vessel two rollers, on which travels an endless chain or cable carrying paddles fixed perpendicularly to it and made capable of folding down.

EVANS, THOMAS, the younger, of Belmont-terrace, Lewisham, Kent, gentleman. *Certain improvements in the rigging of ships, and all other vessels using or carrying sails, whether propelled by steam or otherwise, on whatsoever sea, river, or other water navigated.* Application dated August 1, 1854. (No. 1691.)

The inventor suspends a sail of "any size or shape" to a pole, rail, chain, or rope, by means of a fixed or shifting block, pulley, or other such contrivance, affixed to the yard on which the said sail is to be set.

PALMER, GEORGE HOLWORTHY, of Adelaide-road, Hampstead, Middlesex, civil engineer. *Improvements in guns, gun-carriage, and appurtenances, and in the manipulation or working of guns.* (A communication.) Application dated August 2, 1854. (No. 1700.)

The bore of the gun described by the patentee is made completely through the breech end of it; a key-way or cotter-way is cut through the gun near the breech-end at right angles to the bore, and a key or cotter fits into this, and closes the breech. The patentee also proposes to make arrangements for turning guns on board ship into vertical positions, muzzles downwards, and to load them from the deck below; also to adopt certain methods of reducing the recoil.

CHEVRON, CLÉO, of Paris, mechanician. *Improvements in looms for weaving.* Application dated August 2, 1854. (No. 1701.)

These improvements relate to certain modifications of looms for weaving cut pile fabrics, and to an apparatus for rolling the pile warp threads on their cylinders.

BROWN, JOSHUA, of Stockport, Chester, superintendent of police. *Improvements in the method of consuming smoke.* Application dated August 2, 1854. (No. 1702.)

The inventor closes the front of the fire-place and ash-pit as nearly as possible, and "opens a communication between the flue or chimney and the fire at any convenient situation (in addition to the usual opening to the chimney), by which arrangement the air necessary for the support of combustion must come from the flue or chimney," and is to carry the smoke with it.

GERNER, HENRY, of Moorgate-street, London, architect. *Improvements in the construction of omnibuses, parts of which are applicable to carriages generally.* Application dated August 3, 1854. (No. 1704.)

In the improved omnibus the passengers are to sit back to back, separated by a longitudinal partition, and steps are placed throughout the whole length of the omnibus on each side so arranged as to pass over the wheels.

DAYLEY, MAURICE ATKINSON, of London-street; Fitzroy-square, Middlesex, professor of ventilation. *Improvements in furnaces for the purpose of consuming smoke and economizing fuel.* Application dated August 4, 1854. (No. 1710.)

This inventor so arranges his furnace that the smoke given off from the fuel last thrown on the fire may be caused to pass through a mass of incandescent fuel.

HAMILTON, EDMOND, of Edinburgh, Midlothian, gentleman. *Improvements in the manufacture or production of beverages or occasional drinks.* Application dated August 4, 1854. (No. 1712.)

The inventor describes a variety of methods of treating the juices of apples, plums, cherries, and other English fruits, &c.

PROVISIONAL PROTECTIONS.

Dated October 24, 1854.

2264. Isaac Adams, of Massachusetts, United States of America. New and useful improvements in machinery for printing.

Dated December 23, 1854.

2719. Warren De La Rue, of Bunhill-row, Middlesex, manufacturer. Improvements in treating products arising from the distillation of a certain tar or naphtha to render the same suitable for dissolving or removing fatty or resinous substances.

Dated December 30, 1854.

2758. Francis Preston, of Manchester, machinist. Improvements in bayonets, and in the machinery for manufacturing the same.

Dated January 16, 1855.

116. Jean Antoine François Victor Oudin, of Mons, Département of Seine and Marne, France, priest. A new liquid for preventing sea-sickness.

Dated January 22, 1855.

163. Saunders Trotman, of Portman-square, Middlesex, hydraulic engineer. Improvements in filtering apparatus.

Dated January 26, 1855.

206. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the construction of kites, and in the application thereof to the purposes of carrying lines, and of signalling. A communication from André Marie Préverand, of Paris, France.

Dated January 29, 1855.

215. William Polkinhorn, of Gwennap, near Redruth, Cornwall, miller. Improvements in apparatus for cleansing wheat.

217. John Doddridge Humphreys, of Charlotte-street, Caledonian-road. Improvements in steam engines.

219. George Goodfellow, of Great Fenton, Stoke-upon-Trent, Staffordshire Potteries. Improvements in supplying heated air to the bottoms and flues of potters' and brickmakers' ovens and kilns, and of steam-engine boilers.

221. Thomas Binks, of Wentworth, York, plumber and glazier. Improvements in raising and regulating the supply of water and other fluids.

223. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the generation of steam. A communication from Paulin Jean Charles Montety, of Toulon, France.

225. Ephraim Death and John Popplewell, of Halstead, Essex, engineers. An improved stop-valve or cock for water, gas, and other liquids and fluids.

Dated January 30, 1855.

227. David Moline, of Adelaide-place, London, merchant. Improvements in the manufacture of metallic window-frames and skylights. A communication.

228. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improved filter. A communication.

230. George William Henri, of Fishergate, York. A new compound or meal mixture for feeding cattle.

232. David Warren, of Glasgow, Lanark, engineer. Improvements in screw propellers.

Dated January 31, 1855.

233. John Smith, of Langley Mills, Brancepeth, paper manufacturer, and James Hollingworth, of the same place, both in Durham, manager. Improvements in treating certain fibrous materials for manufacturing paper.

235. Stephen White, of Southport, Lancaster, gentleman. Improvements in the manufacture of pencils or crayons.

237. James Howard, of Bedford, agricultural implement maker. Improvements in ploughs.

239. Martin Samuelson and Alexander Samuelson, of Scott-street Foundry, Hull, engineers and shipbuilders. Improvements in steam-engines.

241. Josiah Harrington, of Pelham-street, Brompton, Middlesex. Improvements in priming fire-arms.

Dated February 1, 1855.

243. William Taylor, of Oxford-terrace, Hyde-park. Improvements in cables for holding at anchor, and towing ships, and other floating bodies.

244. Thomas Ogden Dixon, of Steeton, near Keighley, York, bobbin manufacturer. Improvements in machinery or apparatus for turning, boring, cutting, and shaping wood and similar materials.

245. Alexander Prince, of Trafalgar-square, Middlesex. Improvements in fire-arms. A communication.

246. Isaac Jecks, of Trowse Newton Lodge, near Norwich, Norfolk. A machine for sweeping grass or weeds from lawns or fields, and depositing the same into a box or other receptacle.

247. Alexander William Williamson, of University College, Gower-street, Middlesex. Improvements in apparatus for feeding fires.

Dated February 2, 1855.

248. Benjamin Goodfellow, of Hyde, Chester, engineer. Improvements in ordnance.

250. George Ritchie, of Monmouth-place, New-cross, New Kent-road. Improvements in beds or mattresses.

251. Jules Castel, merchant, and Frederic Mauricheau Beaupré, doctor, of Marseilles, France. A new system of burner for lamps, called the "pyropneumatic burner."

252. Isidore Carlhian and Isidore Corbière, of Castle-street, Holborn, London, and Rue du Sentier, Paris, lamp manufacturers. Certain improvements in moderator lamps.

Dated February 3, 1855.

256. Robert James Maryon (engineer civil), of York-road, Lambeth, Surrey. Improvement or improvements in the construction of, and manufacture of bullets, or shot, or projectiles.

258. Edmund Clegg, of Shore Mill, near Littleborough, Lancaster, and James Leach, of the same place, manufacturers. Improvements in temples for looms.

260. Hippolyte Victor Pinondel de la Bertoche, gentleman, of Paris, French Empire. Certain improvements in manufacturing paper, pasteboard, and pulp.

262. Edward Cecil Bisshopp, of Stonehouse, Devon. Improvements in breech loading fire-arms.

Dated February 5, 1855.

264. Auguste Edouard Loradoux Bellford, of Essex-street, London. An improved mode of constructing hulls of vessels. A communication from *Virgil Putnam Corbett, of Corbettsville, Broome County, New York.*

266. Alexander Morton, of Kilmarnock, Ayr, manufacturer. Improvements in weaving carpets.

268. John Dorrell, of Bilston, Stafford. Improvements in machinery for pressing, squeezing, and rolling iron.

270. John Imray, engineer, of Bridge-road, Lambeth, Surrey. Improvements in measuring instruments.

272. Pierre Joseph Carré, of Asnieres, Seine, France. Improvements in ornamenting fabrics with metal leaf.

Dated February 6, 1855.

274. Deane John Hoare, of Salisbury-street, Strand, Middlesex, esquire. Certain improvements in propelling vessels.

276. Henry Trappes, of Manchester, Lancaster, gentleman. A process for the preparation of leather to be used in the manufacture of a new flock, and for the manufacture of the same, to be used and applied in lieu of flock made from pounded or ground wool and woollen materials, heretofore commonly used in the manufacture of painted, printed, and dyed decorating papers, carpets, oil-cloths, and other things, and also to be used as a paste or pulp for the manufacture of all kinds of paper, parchment, and paste-board, of toys, of ornamental and other picture-frames, of mouldings, architectural and sculptural ornaments, and other things. A communication.

278. Frederick Gray, of Birmingham, Warwick, manufacturer. An improvement or improvements in candlesticks.

280. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the combination of materials for waterproofing and similar purposes. A communication from Jonathan T. Trotter, of New York, United States of America.

282. William Sandford Roberts, of Lodersville, Pennsylvania, U. S. A. Coupling railway carriages.

284. John Grainger, of Birchwood, Alfreton, Derby, brickmaker. Improvements in the manufacture of pantiles.

NOTICE OF APPLICATION FOR PROLONGATION OF PATENTS.

A petition will be presented to Her Majesty in Council by Frederic John Reed, of Friday-street, Cheapside, London, solicitor, Charles Foard, of the Stock Exchange, London, stock jobber, and Thomas Shepperson, of Herne Hill, Camberwell, Surrey, Esq., praying Her Majesty to grant a prolongation of the several letters patent granted to John Juckes, of Lewisham, Kent, but now of the Queen's Prison, Surrey, for England, 4th September, 1841; for Scotland, 28th December, 1841; and for Ireland, 21st April, 1842, for "Improvements in furnaces or fire-places."

On the 29th March, or on the next day of sitting of the Judicial Committee of the Privy Council, if it do not sit on the day mentioned, an application will be made to that Committee to fix an early day for hearing the matters contained in the said petition; and any person desirous of being heard in opposition, must enter a caveat to that effect in the Privy Council Office on or before that date.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 20th,* 1855.)

2157. Thomas Roberts and John Dale. Improvements in obtaining and treating extracts from certain dye woods, and in apparatus for obtaining such extracts.

2177. Robert Cruise. Improvements in machinery or apparatus for stopping railway carriages.

2189. Sir James Caleb Anderson. Improvements in locomotive engines.

2190. Arthur Dobson. Certain improvements in looms for weaving.

2191. Charles Frederick Stansbury. Improved apparatus for heating buildings. A communication.

2192. George Weeks and George Pinner. Improvements in the construction of furnaces.

2195. John Harrison. Improvements in the bosses applied to millstones.

2197. John Coope Haddan. Improvements in the manufacture of cannon, and of projectiles for the same.

2201. Robert Pinkney. Improvements in bottles, jars, and other like vessels, and in the method of stoppering them.

2207. Thomas Edwin Moore. Improvements in apparatus for sharpening knives, scissors, and other similar edged tools.

2218. Louis Cornides. An improved apparatus for amalgamating the gold and silver contained in pulverized ores.

2234. Robert Walter Winfield. An improvement or improvements in tubes and rods used in the construction of articles of metallic furniture.

2237. Peter Armand Lecomte de Fontainemoreau. Improvements in the construction of grates. A communication.

2239. Thomas Biggart and Allan Loudon. Improvements in regulating motive power engines.

2246. William Joseph Smith. A certain improvement in buttons.

2264. Isaac Adams. New and useful improvements in machinery for printing.

2289. Auguste Edouard Loradoux Bellford. An improved mode of operating trip hammers. A communication.

2300. Claude François Vauthier. Certain improvements in blowing machines.

2304. John Wainwright. Improvements in fitting up shops, offices, and other like places and shop-fronts.

2305. John Coope Haddan. Improvements in projectiles, and in machinery for manufacturing the same.

2315. John Henry Johnson. Improvements in lithographic printing-presses. A communication from Pierre Désiré Vaté, of Paris, France, machinist.

2354. William Henry Woodhouse. An improved meter for water and other liquids.

2379. John Berry, Richard Berry, Thomas Berry the younger, and Thomas Royds. Certain improvements in machinery for spinning, commonly known as "mules."

2398. James Thomson. An improvement in obtaining motive power when fluids or liquids are used.

2399. Peter Armand Lecomte de Fontainemoreau. Improvements in fire-engines. A communication.

2511. John Kealy. Improved machinery for cutting up turnips and other roots.

2550. Edward Hammond Bentall. An improved construction of locomotive steam-engine.

2653. James Fenton. Improvements in the manufacture of axles, piston rods, and shafts, girders, and other like articles.

2719. Warren de la Rue. Improvements in treating products arising from the distillation of a certain tar or naphtha, to render the same suitable for dissolving or removing fatty or resinous substances.

2758. Francis Preston. Improvements in bayonets and in the machinery for manufacturing the same.

31. Robert Ashworth and Samuel Stott. Improvements in machinery for preparing, spinning, and doubling fibrous substances.

95. Gustav Warnecke. Improvements in preserving vegetables and fruits.

151. William Smith and Thomas Phillips. Improvements in cocks or taps, and in balls or floats to be used therewith.

221. Thomas Binks. Improvements in raising and regulating the supply of water and other fluids.

223. John Henry Johnson. Improvements in the generation of steam. A communication from Paulin Jean Charles Montety, of Toulon, France.

226. Edward Cunnah and John Hampson. Improved turnstile counting apparatus.

239. Martin Samuelson and Alexander Samuelson. Improvements in steam engines.

243. William Taylor. Improvements in cables for holding at anchor and towing ships, and other floating bodies.

244. Thomas Ogden Dixon. Improvements in machinery or apparatus for turning, boring, cutting and shaping wood and similar materials.

248. Benjamin Goodfellow. Improvements in ordnance.

252. Isidore Carlhian and Isidore Corbière. Certain improvements in moderator lamps.

260. Hippolyte Victor Pinondel de la Bertoche. Certain improvements in manufacturing paper, pasteboard, and pulp.

266. Alexander Morton. Improvements in weaving carpets.

280. John Henry Johnson. Improvements in the combination of materials for waterproofing and similar purposes. A communication from Jonathan T. Trotter, of New York, United States of America.

282. William Sandford Roberts. Coupling railway carriages.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty - one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed February 16, 1855.

1834. Thomas Miller.
1852. James Hadden Young.
1947. Joseph Westwood and Robert Baillie.

Sealed February 20, 1855.

1839. Thomas Lees.
1860. Thomas Hayter.
1861. Hector Grand de Châteauneuf.
1869. William Woodcock.
1890. Louis Napoleon Langlois and Jean Baptiste Clavières.
1892. John Seithen.
1908. John Macmillan Dunlop.
1911. Peter Armand Lecomte de Fontainemoreau.
1928. George Mackay Miller.
1953. Henry Lund.
2121. Alfred Vincent Newton.
2387. Edward Loysel.
2403. Ismaël Isaac Abadie.
2609. Alfred Vincent Newton.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

A. B., of Glasgow, writes as follows:—"A. and B. were both experimenting on a new mechanical invention. The matter was unknown to each other, and B., after getting satisfaction from his experiments, applied for letters patent, and obtained them. Some months after having the complete specification filed, B. hears of A. trying the same machine, and calls upon him to stop his proceedings. A., however, holds that he has no right to stop, because of his experimenting so long (as he alleges) before B. secured the letters patent. He thinks that he has a prior claim, although as yet his machine is not complete, and therefore objects to stop his proceedings. *Query.*—Can A. on that account be allowed to proceed in the face of B.'s letters patent?" A. has no claim whatever in the matter. The first inventor, in the eye of the law, is he who first discloses his invention to the public. A. made no publication whatever, but was engaged on a series of private experiments before the date of B.'s patent. Unless B. obtained the invention from A., B. would be held legally to be the first and true inventor, and, as such, entitled to his patent.

Tyro.—The relative advantages of convex, concave, and straight water-lines for the bows of vessels have long been under discussion, and your suggestion, therefore, contains nothing new.

Septimus.—If you will take the trouble to refer to our part for August last, you will there find an abstract of the specification of the patent named, under the head, "Complete Specifications Filed with Applications."

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co., *Dublin*; *W. C.* Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1647.] SATURDAY, MARCH 3, 1855. [Price 2d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

PARSEY'S PATENT COMPRESSED-AIR ENGINE.

Fig. 1.

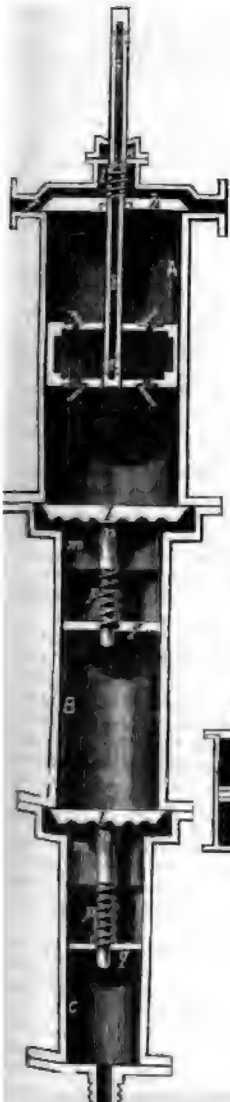


Fig. 6.

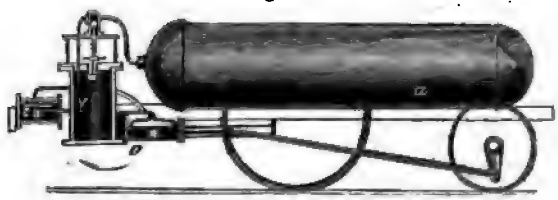
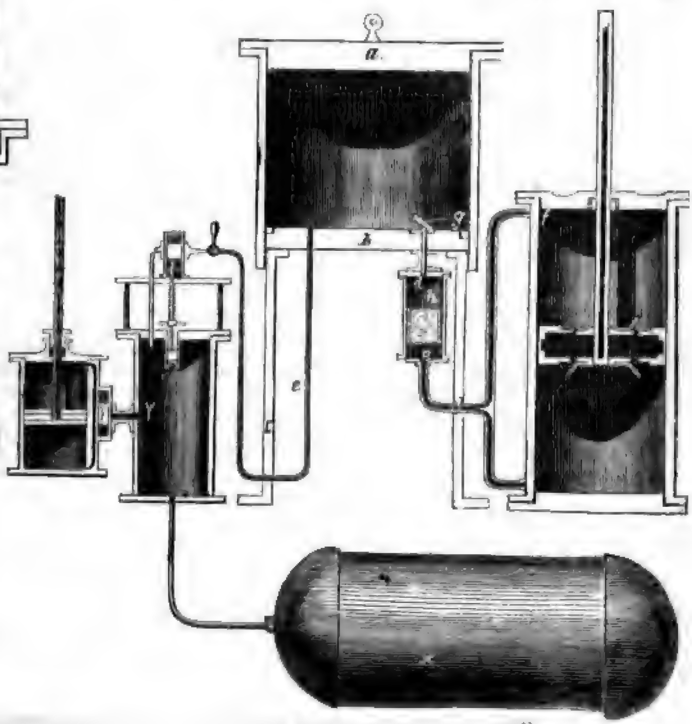


Fig. 7.

Fig. 4.



PARSEY'S PATENT COMPRESSED-AIR ENGINE.

(Patent dated January 13, 1854.)

MR. PARSEY, whose former improvements in the employment of air as a source of motive power are well known, has recently patented an invention which consists, *first*, in the employment of an improved pump, used for compressing or exhausting air; *second*, in the construction of an apparatus, called an aerometer, or movable reservoir, for receiving and storing air or water forced into it, and for giving it out again under pressure when required; and *third*, in a mode of heating the working cylinder of an engine.

Fig. 1 of the accompanying engravings shows a double-action pump constructed according to the first part of the invention. A A is a cylinder or pump-barrel, with a hollow piston, *a a*, and hollow piston-rod, *b*; the piston being furnished with valves, *c c*, on the top opening upwards, and others, *d d*, on the bottom opening downwards. The piston-rod is perforated within the piston, *e*, and at the end, *e*, clear of the length of the stroke, forming thereby an inlet or passage for the air or other fluids. As the piston descends, the valves, *d d*, will close, and the valves, *c c*, will open and admit the air above the piston. As the piston ascends, the valves, *c c*, will close, and the valves, *d d*, will open, and the contents of the pump will be expelled at the top and bottom of the cylinder by the passage or passages, *f*, or other outlet ports. When the cylinder is left open at the top, and the contents of the pump are only required to issue from the bottom, the piston will require to be valved on the under side only, and the outlet passage may be suitably adjusted to the purposes of single action pumps.

The metal piston must be accurately fitted into the cylinder, and a channel, *g*, cut around the top and bottom, into which is securely fitted a ring packing or cup of leather, or other suitable material, which, from the pressure of the fluid within the cylinder, will secure the piston from leakage. *h h*, is the upper valve, as large as the cylinder, through which the piston-rod slides, a spiral spring, *i*, being coiled around the rod to keep the valve seated.

Fig. 2 is a plan of the piston, *a*, showing the channel, *g*, the valves, *c c*, and the section of the piston-rod, *b*. Instead of constructing the top and bottom similarly, the cylinder, B, may be connected to the top of the cylinder, A (fig. 1), the valve, *l*, forming the bottom of the cylinder, A; and a series of cylinders or barrels, A, B, C, with similar valve fittings may be graduated, for the purpose of obtaining and applying compressed air or any other elastic fluid at a high density.

Fig. 3 is a plan or transverse section of the valve, *l*, showing the guide gland, *m*, with hollows or curves, *m m*, and the fillets, *n n*, which fit the cylinder, B. *o* is the guide-rod, which has a spiral spring, *p*, coiled round it to keep it seated, the rod working through a central hole in the fixed guide-piece, *q q*, made of a similar form to the guide-gland, *m n*, and fitting the cylinder, B. Each succeeding valve of a series of cylinders of the same size may be adopted in this or a similar manner to effect the same purpose.

Fig. 4 shows an aerometer constructed according to the second part of the invention, and worked by means of the pump before described. *a a* is a cylinder, closed at one end and turned mouth downwards over the block or piston, *b*, which is fixed on legs or a framing, *c c*; a channel or groove, *g*, is cut around the edge of the piston, *b*, and is fitted with a cup or packing, as illustrated in fig. 1. *d* shows an inlet valve and pipe, and *e* shows the outlet passage and pipe for conducting the discharge. "On the cylinder, *a a*, being forced up by any means, it will fill with air, water, or other fluid. On attaining its elevation, by closing the inlet or injection-pipe, *d*, or disengaging it from the lifting tackle, its weight will cause it to descend, and force its contents through the conducting pipe, *e*. *h*, in fig. 4, is a small cylinder, which may be fitted on to the injection-pipe, *d*, to assist the injection of air or elastic fluids, and to prevent back pressure. A block, *i*, slightly domed, is placed on the bottom, with a deep cup, *k*, of leather or other flexible material, which may be nearly filled with water, oil, or other liquid, forming a valve for the elastic fluids to pass around, whence they pass onward through the upper part of the pipe, *d*, the pressure of the fluid on the cup valve preventing back leakage."

Instead of forcing air or water into the movable reservoir, *a a*, by means of a pump or pumps, the reservoir may be charged by drawing it up, and opening valves to permit the air or water to be forced up into it by the pressure of the atmosphere. When charged, the inlet valve or valves being closed, and the power applied for elevating the reservoir disconnected from it, the reservoir will be left free to descend, and by its weight (with or without the aid of any additional weight placed upon it) force out the air or water contained in it whenever the outlet-valve shall be opened for that purpose. Instead of using only one such reservoir, several may be employed. The inventor, in his specification,

shows a combination of six, arranged about a centre, and supported on a suitable framework. In the centre of them is placed an hydraulic lift, with a framing fixed on to the head of the ram, and bolted on to the top of each of the cylinders. When the water is forced in under the ram, it with the six cylinders and connecting framing will be raised, causing a space or vacuum, which will be filled by air, water, or any other fluid passing through the inlet-pipe or pipes as the cylinders are elevated. On the water being withdrawn from under the ram, and the discharge-pipe opened, the whole weight of the head work, ram, and cylinders will cause their descent, and discharge the contents. From the well-known character and construction of hydraulic machinery, no further description need be given of that means of lifting.

In fig. 4, Y is a cylinder and apparatus attached to the reservoir, for regulating the working pressure of the compressed air or other elastic fluids contained in it, for which (with other things) Mr. Parsey obtained letters patent, October 17, 1844. Z Z, fig. 4, is a section of a piston-engine, actuated by the regulated pressure of compressed air from the interposed regulator, which is introduced for the purpose of illustrating the action of the apparatus.

Fig. 6 shows the application of air-pumps to a compressed air locomotive engine. *a a* is a reservoir to be charged with compressed air to a high density or pressure; Y is the regu-

Fig. 3.

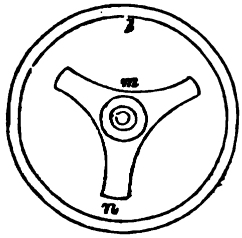


Fig. 2.

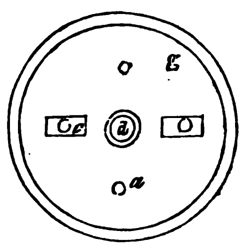
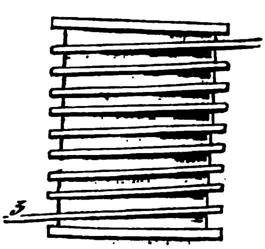


Fig. 5.



lator of the working pressure; and *c* is the driving engines actuated by the pressure. To economize the store of power in the reservoir, *a*, pumps, *b*, are attached to the working machinery, or to cranks or eccentrics on the axletrees or otherwise, for obtaining and applying an auxiliary supply of compressed air to the regulating cylinder, Y, so that the draught on the reservoir, *a a*, may be economized. The pumps are intended to be worked by means of the momentum of the locomotive whilst it is descending an inclined plane, or when it may be necessary to stop the engine, so that the power necessary to retard or stop the motion of the train with which it is connected, may be applied in pumping air into the regulator, Y, or a spare reservoir, X, shown in fig. 4. The pumps may be furnished with blow-off cocks, or other means, so as to be capable of being thrown virtually out of action when not required for the purpose above mentioned, and may be placed in connection with the machinery of the engine, or on tenders or carriages drawn by the engine. Fig. 7 is a plan of fig. 6, showing in outline the pumps, *b*, and regulator, Y, connected with cranks on the axle, the driving machinery and other gearing of a locomotive engine being too well known to need further description.

The third part of the invention is shown in fig. 5. The heating is effected by means of a coil of pipe, *z z*, surrounding the cylinder, and a current of hot air or water sent through the pipe, so as to keep the cylinder hot, for the purpose of increasing the expansive action of the air admitted into it during the working of the engine. The temperature will be kept up more effectually if the coil of pipe be surrounded by an external jacket or covering.

ON MAGNETIC REPULSION.*

BY PROFESSOR TYNDALL, F.R.S.

The lecturer commenced by showing that bodies are repelled by the poles of a magnet, in virtue of a state of excitement into which they are thrown by the latter. The repulsion of bismuth, and the attraction of soft iron, followed precisely the same laws when

* The substance of a paper recently read at the Royal Institution.

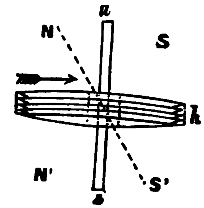
the strength of the influencing magnet was augmented, the respective forces being proportional, not simply to the strength, but within wide limits, to the square of the strength of the magnet. The result is explained in the case of iron by the fact of its being converted, while under magnetic influence, into a true temporary magnet, whose power varies with that of the influencing one; and in the case of bismuth, the result can only be explained by the fact that the dia-magnetic mass is converted into a true *dia-magnet*.

It was next shown, that the condition of excitement evoked by a magnetic pole was not the same as that evoked by another pole of an opposite quality. If the repulsion were independent of the quality of the pole, then two poles of unlike names ought to repel the bismuth, when brought to act upon it simultaneously. This is not the case. Two poles of the same name produce repulsion; but when they are of equal powers and opposite names, the condition excited by one of them is neutralized by the other, and no repulsion follows.

Bars of magnetic and dia-magnetic bodies were next submitted to all the forces capable of acting upon them magnetically; first, to the magnet alone; secondly, to the electric current alone; and, thirdly, to the magnet and current combined. Attention to structure was here found very necessary, and the neglect of it appears to have introduced much error into this portion of science. Powdered bismuth, without the admixture of any foreign ingredient, was placed in a strong metallic mould, and submitted to the action of a hydraulic press; perfectly compact metallic masses were thus procured, which, suspended in the magnetic field with the line of compression horizontal, behaved exactly like magnetic bodies, setting their longest dimensions from pole to pole. This identity of deportment with an ordinary magnetic substance was also exhibited in the case of the electric current, and of the current and the magnet combined. In like manner, by the compression of a magnetic powder, magnetic bars were produced, which, between the two poles of a magnet, set exactly like ordinary dia-magnetic ones; this identity of deportment is preserved when the bars are submitted to the action of the current, and of the current and magnet combined. Calling those bars which show the ordinary magnetic and dia-magnetic action *normal bars*, and calling the compressed bars *abnormal ones*, the law follows, that an abnormal bar of one class of bodies exhibits precisely the same deportment, in all cases, as the normal bar of the other class; but when we compare normal bars *of both classes* together, or abnormal bars of both classes, then the antithesis of action is perfect. The experiments prove, that if that which Gauss calls the *ideal distribution* of magnetism in magnetic bars be inverted, we have a distribution which will produce all the phenomena of dia-magnetic ones.

The important question of dia-magnetic polarity was submitted to further and stricter examination. A flat helix, whose length was an inch, internal diameter an inch, and external diameter seven inches, was attached firmly to a table, with its coils vertical. A suspension was arranged by means of which a bar of bismuth, five inches long, and 0·4 of an inch in diameter, was permitted to swing freely, while surrounded by the helix. With this arrangement the following experiments were, or might be made:—1. A voltaic current from twenty of Grove's cells was sent through the helix, *h*, the direction of the current *in the upper half* of the helix being that denoted by the arrow (fig. 1).

Fig. 1.

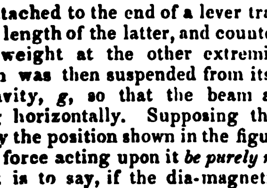


The north pole of a magnet being placed at N, the end, *a*, of the suspended bar of bismuth, *a b*, was *attracted* towards the pole, N. 2. The south pole of a second magnet being placed at S, and the current being sent through the helix in the same direction as before, the bar left its central position, and approached N with greater force than in the former experiment. The reason was deemed manifest; the state of excitement which causes *a* to be attracted by N, causes it to be repelled by S; both poles, therefore, act in unison, and a deflection of greater energy is produced. 3. The pole, S, being removed to the position S′, the deflection was also found to be about twice as forcible as when the single pole, N, was employed. Here, also, the reason is plain; the two ends, *a* and *b*, of the bismuth bar are in different states of excitement; the end *a* is attracted by a north pole, the end *b* is attracted by a south pole; both poles act, therefore, as a mechanical couple upon the bar, and produce the deflection observed. 4. The pole, S′, was replaced by a north pole of the same strength, thus bringing two poles of the same name to bear upon the two ends of the bar; there was no deflection by this arrangement; it is manifest that N's attraction for the end *a* was nullified by the repul-

sion of the end *b* by a like pole; the experiment thus furnishes an additional proof of the polar condition of *a b*. 5. We have supposed the pole, S, to be removed into the position, S′; but permitting the pole, S, to remain, and introducing another pole (a south one) at S′, a greater action than that produced with two magnets was obtained. 6. Finally, adding another north pole at N′, and allowing four magnets to operate upon the bismuth bar simultaneously, a maximum action was obtained, and the bar was attracted and repelled with the greatest promptness and decision. *In all these cases, where an iron bar was substituted for the bismuth bar, a b, a deflection precisely the opposite to that exhibited by a b was produced.* A branch of the current by which the bar of bismuth was surrounded could be suffered to circulate round a bar of iron, suspended freely in an adjacent helix; when the forces acting upon the iron were the same as those acting upon the bismuth, the bars were always deflected in opposite directions.

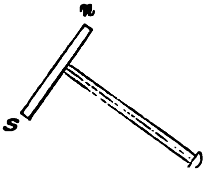
The question of dia-magnetic polarity was next submitted to a test which brought it under the dominion of the principles of mechanics. A mass of iron was chosen for the movable magnetic pole, of such a shape that the diminution of the force emanating from the pole, as the distance was augmented, was very slow; or, in other words, the field of force was very uniform. Let the space in front of the pole, P (fig. 2), be such a field.

Fig. 2.



A *normal* bar of bismuth, *a b*, was attached to the end of a lever transverse to the length of the latter, and counterpoised by a weight at the other extremity; the system was then suspended from its centre of gravity, *g*, so that the beam and bar swung horizontally. Supposing the bar to occupy the position shown in the figure, then if the force acting upon it *be purely repulsive*—that is to say, if the dia-magnetic force be unpolar—it is evident that the tendency of the force acting upon every particle of the mass of bismuth tends to turn the lever round its axis of suspension, in the direction of the curved arrow. On exciting the magnetism of P, however, a precisely contrary motion is observed—*the lever approaches the pole.* This result, which, as far as the lecturer could see, was perfectly inexplicable on the assumption that the dia-magnetic force was purely repulsive, is explained in a simple and beautiful manner on the hypothesis of dia-magnetic polarity. According to this, the end *b* of the bar of bismuth is repelled by P, and the end *a* is attracted; but the force acting upon *a* is applied at a greater distance from the axis of suspension than that acting upon *b;* and as it has been arranged that the absolute intensities of the forces acting upon the two ends differ very slightly from each other, the mechanical advantage possessed by *a* gives to it the greatest moment of rotation, and the bar is attracted instead of repelled. Let a magnetic needle, *n s* (fig. 3), be attached like the bar, *a b* (fig. 2), to a lever, and submitted to the earth's magnetism.

Fig. 3.



Let the north pole of the earth be towards N; the action of the pole upon *n* is attractive, upon *s* repulsive; the absolute intensities of these forces are the same, inasmuch as the length of the needle is a vanishing quantity in comparison with its distance from the pole, N; hence the mechanical advantage possessed by the force acting upon *s*, on account of its greater distance from the axis of rotation, causes the lever to recede from N, and we obtain a result perfectly analogous to that obtained with the bar of bismuth (fig. 2).*

ON THE FLOW OF WATER THROUGH PIPES AND ORIFICES.

At the Institution of Civil Engineers, on Tuesday, February 20th, the evening was again entirely devoted to the discussion of Mr. Leslie's Paper on the above subject.

It was stated, that the necessity for introducing into the recognised formula some modification to adapt it to cases greatly de-

* A paper submitted to the Royal Society last November, and a portion of which formed the subject of the Bakerian Lecture for the present year, contains a more comprehensive discussion of this subject. In it are explanations of the difficulties adduced by M. Matteucci, in his instructive "Cours Special," recently published.

parting from a medium velocity or dimensions, had been admitted and fully discussed by D'Aubuisson and by Weisbach; the former suggesting the law of increase of friction to be as the square of the velocity, plus a certain addition of the velocity itself; the latter proposing a law of increase compounded of the square, plus the square root of the cube of the velocity. It was argued, however, that in cases where such modifications were necessary, they should rather be applied at fixed velocities of the water, than at any fixed gradient.

A comparison was instituted between the friction of water in pipes with that known under the term "skin resistance" of vessels passing through water. It appeared from the results obtained by Mr. Leslie, in the experiments on the pipes of the Edinburgh Water Company, and those by Colonel Beaufoy on floating bodies, that there was a marked identity of the diminution of the law of increase from that of the squares, as the higher speeds were attained; and also that the resistance per square foot of the side of a ship was only about one-half that per square foot of the internal surface of a pipe, at identical velocities. Whether this had any reference to the mass of water around the ship, as compared with the contents of a pipe, was a subject for consideration.

It was explained that the expression known as "Hawksley's formula" was only assumed to be applicable to useful, practical cases, falling within the ordinary practice of hydraulic science, and extreme cases of minute diameter and almost vanishing velocity were expressly excluded. The meaning of the term "friction" in hydraulics, was explained to be that resistance encountered in the conducting of water which varied as the square of the velocity. The influence of the adhesion of the particles of water to the internal periphery of the pipes was then explained, in order to render clear that of which all engineers, combining science with practice, were well aware that, within certain limits, the friction of water in pipes was independent of the nature of the material over which it flowed. In fact, the adhesion of a film of fluid to the interior of the pipe, caused the formation of a tube of water, through which the body of water flowed, virtually reducing the diameter which was provided for in the formulæ. There must be some resistance, whatever the pipe might be composed of, but as the film of water was equally existent, under all circumstances, so the resistance was identical in all cases. On this assumption Du Buat and Dr. Young had given the corrections in their formulæ. The result had been, that if the equations mentioned, modified for rivers, or for ordinary cases of pipes for waterworks, were applied, the results would be found to coincide accurately with those of practical experiments when correctly performed. This had been confirmed by accurate investigations and by gauging rivers, and also by the examination of sewers, as shown in Mr. Wicksteed's Report on the Drainage of Croydon.

It had been assumed that the greater fall of side branches or inlets increased the velocity of the flow in main sewers; practice, however, showed this assumption to be fallacious, as the various bends and junctions caused considerable retardation of the current. It was maintained that the explanation of the resistance of the interior periphery of pipes, of whatever material they were composed, was consistent with the results of actual experiment, and that any further expenditure on trials for demonstrating the supposed advantages of smoothness of internal surface would be entire waste. On the other hand, it was well known that the state of the external surface had much influence on the resistance of floating bodies moving through water; and no doubt this fact had, from analogy, led to the delusion that the smoothness or otherwise of the internal surface of pipes would exercise an influence on the velocity of the flow of water.

The facts which had been stated with respect to the experiments of the Trial Works Committee of the former Commissioners of Sewers, and the corrupt use that had been made even of those worthless experiments, was another striking instance of the bad effects produced on private enterprise, and on the development of sound practice, by the rapid growth of functioneering influence during late years. The always useless, and sometimes injurious interference of the Railway Department of the Board of Trade, of the Harbour Commission, and of the Board of Health, was strongly insisted upon, and well-known instances were given in support of that opinion — referring to previous discussions at the Institution as examples. During a long period of peace the cumbrous machinery of Government departments had been presumed to have been rendered perfect, and was assumed to be so, whilst no demand was made on their active energies, or so long as no exigencies arose; but the late melancholy and disastrous events had shown their utter inability to fulfil their functions under any unexpected pressure, or to conduct any practical measure in a business-like manner; why, therefore, it was urged, should the rising generation of engineers be restricted and controlled by officials, not deriving their appointments from merit, but from personal or political influence?

In extenuation of the alleged perversion of the experiments of the Trial Works Committee, it was stated that the results had not been wilfully perverted, but the apologist would not render himself responsible for the acts of the Board of Health; still it must be remembered that other engineers besides those employed by that Board had extensively used pot pipes for sewers, and there were instances of small sewers of two thousand years old. The sweeping denunciation of the acts and constitution of the late Board of Health was earnestly deprecated.

In reply, it was urged that the remarks made were not personal, but were directed against a system proved to be pernicious, and from which the most serious results must be anticipated. That the engineers who had used pot-pipes for main sewers had only done so under the compulsory pressure of the Board of Health, as by no other means could they have procured permission to execute the drainage works they had undertaken. With respect to the experiments of the Trial Works Committee, it was remarkable that whilst the results of experiments which had cost upwards of £7,000 had been suppressed, the late Board of Health had not hesitated to pay a considerable sum for some tables of observations of a similar nature, made by an individual, and to publish and circulate them extensively.

The Origin and Progress of the Mechanical Inventions of James Watt. Illustrated by his Correspondence with his Friends, and the Specifications of his Patents. By James Patrick Muirhead, Esq., M.A. 3 Vols. John Murray, Albemarle-street.

Mr. Tennyson's Princess, in one of her outbreaks of brilliant declamation, describes "Fame" as a

> "Flake of rainbow flying on the highest
> Foam of men's deeds."

The fame of James Watt is certainly of a much more solid character than that to which this description is applicable. Day by day, as the arts and manufactures which the inventions of that great man have fostered thicken in this land, and extend themselves to others, new tributes are paid to his genius, and new lustre is added to his reputation. Nor is it fanciful to say, that while to him we are consciously indebted for very many of the comforts and advantages of our social life, we unconsciously owe to him a thousand things which daily afford us either pleasure or profit. Although less than forty years have passed since James Watt died, we shall shortly see, as one of the results of his discoveries, "a hundred pennants" borne at will from end to end of the Baltic, without regard to wind or tide.

In noticing the volumes mentioned above, we do not propose to lay before our readers any connected history of Watt, but simply to bring forward a few interesting particulars connected with those discoveries and inventions which will be for ever memorable to the lovers of mechanical science.

It was after spending a year of apprenticeship to a mathematical instrument maker in London, and during the pursuit of his trade as instrument maker to the University of Glasgow, that Watt conceived the first idea of THE CONDENSING STEAM-ENGINE. The circumstances attending this great conception, as detailed by Watt himself, have been brought to light by the researches of Mr. Muirhead, who, in the volumes before us, presents lengthy extracts from a long series of letters from Mr. Watt, discovered in the archives of his brother-in-law, by which he (Mr. M.) is enabled "to complete a copious journal of the course of Mr. Watt's life and thoughts, his novel ideas and versatile experiments, while he was engaged in devising and essaying his very earliest, and all other successive improvements in the steam-engine."

"Mr. John Hart," says Mr. Muirhead, "an ingenious tradesman of Glasgow, who was a native of Borrowstoness, and, together with his brother, was distinguished by a predilection for the practical arts connected with science, has related, that Mr. Watt frequently conversed with him on subjects of mechanical interest; and that being asked by him in 1817 whether he recollected how the first idea of his great discovery came into his mind, he replied, 'Oh yes, perfectly. One Sunday afternoon I had gone to take a walk in the Green of Glasgow, and when about half-way between the Herd's House and Arn's Well, my thoughts having been naturally turned to the experiments I had been engaged in for saving heat in the cylinders, at that part of the road the idea occurred to me, that *as steam was an elastic vapour it would expand, and rush into a previously exhausted space; and that if I were to produce a vacuum in a separate vessel, and open a communication between the steam in the cylinder and the exhausted vessel, such would be the consequence.*'"

For a long time prior to the year 1800 Watt and his partner, Mr. Boulton, were almost constantly occupied with litigation

in defence of their patents.* From a document, entitled "A Plain Story," prepared by Watt, in 1796, as a general answer to the objections which his opponents raised to his specifications, we derive the following details respecting the manner in which his invention of separate condensers was developed. This document commences thus:

"W. found that a well-made brass model of Newcomen's engine consumed quantities of steam and fuel, out of all reasonable or direct proportion with larger engines. He consulted Désaguliers' 'Natural Philosophy,' and Belidor's 'Architecture Hydraulique,' the only books from which he could hope for information. He found that both of them reasoned learnedly, but by no means satisfactorily; and that Désaguliers had committed a very gross arithmetical error, in calculating the bulk of steam from the water evaporated in a common steam-engine; which being rectified, it appeared next that his data, or assumed facts, were false. By a simple experiment, W. found what was the real bulk of water converted into steam; and from his friend Dr. Black he learned what was the heat absorbed and rendered latent by the conversion of water into steam, which the Doctor then publicly taught, and had done for some years. Experiments had been made long before by Dr. Cullen, Mr. John Robison, and others, in public classes, which proved that water, when placed in an exhausted receiver, boiled, and was converted into steam at the heat of 70° or 80° of Fahrenheit's thermometer, while it was well known that under the pressure of the atmosphere it required 212° of heat to make it boil, and emit steam capable of displacing the air. It was evident that under intermediate pressures, intermediate degrees of heat would be required to make it boil, and that in the steam-engine more or less cold water must be thrown in, according to the degree of exhaustion which might be required; or, in other words, according to the number of pounds per inch the engine was loaded to."

After describing Savery's and Newcomen's engine with admirable precision, Watt goes on to say,

"Of all those things, Watt must say, '*Non ea nostra voco.*' The things that are his remain to be told.

"He found, by the application of the knowledge which has been mentioned, that the cause of the great consumption of fuel was, that the cylinder being cooled by the injection-water, that vessel *must* condense a large quantity of steam whenever it was attempted to be again filled with steam; that the vacuum could not approach to perfection without the steam was cooled below 100°; and that such cooling would increase the evil complained of in a fourfold or greater ratio, because the penetration of the heat or cold into the cylinder would be as the squares of the differences of the heats between that vessel and the steam. How was this to be avoided?

"He tried to make the cylinders of wood or other materials which conduct heat slowly, but he could not prevent the steam from coming into contact with the comparatively cold water which remained in the bottom of the cylinder, and which must be expelled by the steam; besides, his wooden cylinders did not seem likely to be of long duration. In such like experiments he spent much time, and more money than was suitable to his circumstances, yet he made no advances towards a beneficial discovery. But the matter having got firm hold of his mind, and his circumstances obliging him to make exertions to regain what he had spent, he turned the matter over in every shape, and laid it down as an axiom—*that to make a perfect steam-engine, it was necessary that the cylinder should be always as hot as the steam which entered it, and that the steam should be cooled down below 100° in order to exert its full powers.* The gain by such construction would be double:—first, no steam would be condensed on entering the cylinder; and secondly, the power exerted would be greater as the steam was more cooled. The *postulata*, however, seemed to him incompatible, and he continued to grope in the dark, misled by many an *ignis fatuus*, till he considered that steam being an elastic fluid, it must follow the law of its kind; and that if there were two vessels, A and B, of equal or other dimensions, the one, A, filled with steam, and the other, B, exhausted, if a communication were opened between those vessels, the steam would rush from the full one into the empty one, and they would both remain half exhausted (if the vessels were equal in size), or be filled with steam of half the density. If, then, into the second vessel, B, an injection of cold water were made, or cold water applied to its outside in sufficient quantity, the portion of steam which it contained would be condensed or reduced to water; and by the same law of nature that

* "A bill of costs," says Mr. Muirhead, "sent in by one firm of solicitors in London, for their outlay and professional services in matters connected with the various infringements, has been preserved, and is now before us, amounting, for the short space of the four last years of the time to which the extension of the patent was limited, viz., from 1796 to 1800, to between five and six thousand pounds! This was unquestionably a fearful tax, —a burden grievous to be borne by the successful discoverer in science, and his enterprising associate, in seeking the final, though tardy, enforcement of justice!"

had operated before, more steam would issue from A into B until the whole was condensed, and nearly a perfect vacuum established in both vessels; yet as the cold water bad not entered or touched A, that vessel would still retain its heat.

"This idea once started, the rest immediately occurred. The vessel A being supposed to be the cylinder, B would be the vessel called now the condenser; the water, air, &c., accumulated in B, he immediately saw could be discharged or drawn out by means of a pump, or the water might be let run out by a pipe more than 34 feet long going downwards, and the air might in that case be expelled at a valve by filling B with water, provided the descending eduction-pipe were shut meanwhile. On the whole, however, he preferred the pump. Another difficulty appeared, which was the making the piston tight. That could not be done with water, as in Newcomen's engines; for that might get in and evaporate, and produce steam. He, therefore, thought of wax, oil, and similar substances as substitutes, knowing that they would not evaporate in the heat of boiling water; and, for greater security, he proposed to employ the steam itself as the acting power on the piston.

"The diameters of the pipes necessary to convey the steam into and out of the cylinder, he regulated from those in use. The size of the condenser he assumed at random, as he did that of the air-pump, which it was evident must be larger than was necessary to contain the water and probable quantity of air. All this passed in his mind in the course of a few hours; and in a few days he had a model at work, with an inverted cylinder, which answered his expectations, and was, as far as he remembers, equal in its properties of saving steam and fuel to any he has made since, though in point of mechanism much inferior. Very simple cocks were employed as regulators or steam-valves, and his air-pump and condenser were of tin-plate. His cylinder, however, was good, and of brass, [about] 2 inches diameter and a foot long; the cocks were turned by hand, instead of being wrought by the engine."

The "Plain Story" afterwards proceeds:

"Had W. been content with the mechanism of steam-engines as they then stood, his machine might soon have been brought before the public; but his mind ran upon making engines *cheap* as well as *good*, and he had a great hankering after inverted cylinders and other modifications of his invention, which his want of experience in the practice of mechanics in great, flattered him would prove more commodious than his matured experience has shown them to be. He tried, therefore, too many fruitless experiments on such variations. He wanted experience in the construction of large machines; that he endeavoured to acquire; but experimental knowledge is of slow growth, and with all his ingenuity, *so much boasted to his prejudice*, he was concerned in making some very indifferent common engines. Other avocations, to him necessary, obliged him to turn his attention from the subject till he obtained the patent, so that at that time he had made no advances in the improvement of the mechanism. He, therefore, thought it proper to specify only what was his invention; and to leave any mechanical improvements he might make to be secured by other patents, if worthy of them."

The document concludes thus:

"It was found that the external cylinder, or steam-case, was very expensive. The method of covering *the cylinder itself* with a lid or cover (which had been used in some of the models), and conveying the steam to the lower end of the cylinder by a pipe, was adopted, and a less expensive method of applying the envelope of steam was used. Other kinds of regulators were invented, and the whole mechanism of the engine was gradually improved, and these improvements have been progressive for the last twenty-one years. Some of them W. has secured by other patents, but many of the most essential he has left free, and by means of them Newcomen's engines have been improved to his loss.

* * * *

"W.'s invention is merely a contrivance to prevent cooling the cylinder, and to make the vacuum more perfect *by condensing the steam in a vessel distinct from the cylinder itself;* this is the nature of the invention. The means of keeping the cylinder warm—the substitution of the powers of steam for those of the atmosphere—of grease, &c., in place of water to keep the piston tight—and the drawing out the air, &c., by means of pumps—are merely aids in performing the principal object. This ought to be kept in view in judging of the specification; also, that W. supposed it to be addressed to mechanics and philosophers, and not to the ignorant."

(*To be continued.*)

ON THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

Sir,—In the letter signed "Indagator," which appeared in your Number for February 3rd (page 106, column 2), there is an erroneous statement, which I take the liberty of pointing out to the able writer, and which I should have noticed before, had I read his letter carefully through. Taking,

however, but little interest in the confutation of such unintelligible productions as Mr. Recordon's, I had only glanced slightly at the first letter of "Indagator," until my attention happened to be called to it by a friend.

The error to which I allude is the reference to the principal axes of a body as being permanent axes of rotation. This is only true *when no forces act.* "Indagator," indeed, asserts that "the earth's attraction exerts no force to interfere with the motion of rotation which the moon has had impressed upon her round one of her principal axes." But he has given no proof of this assertion, and it does not follow at all from the above-named property of the principal axes. That property, as I have just said, applies only to the case of a body moving perfectly free, and not under the action of external forces.* The attraction of the earth is an external force acting on the moon, and therefore the proposition respecting principal axes being permanent ones of rotation, does not apply in this case.

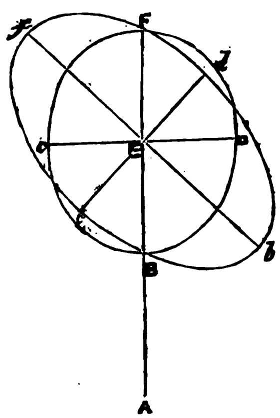
It is shown in books which treat of these subjects (as, for instance, Pratt's "Mechanical Philosophy," second edition, art. 459, 460), that if we neglect very small quantities, the attraction of the sun and moon does not alter the velocity of the earth's rotation round its axis (which is a principal and permanent axis in this case). Now, the same *may* be equally true with regard to the attraction of the sun and earth on the moon. But it requires *proof*, and does not merely form a consequence of that principle which "Indagator" has brought forward.

With regard to Mr. Recordon and his communication, I certainly wonder that "Indagator" has taken so much trouble as he seems to have done in the effort to extract any sense from what is utterly without sense.

As the name of that great mathematician, D. Bernoulli, however, has been introduced into the controversy, I shall add a few remarks with regard to his views. The passages quoted by Mr. Recordon occur in the third chapter of his "Traité sur le Flux et Reflux de la Mer." This chapter (as Sir J. W. Lubbock has remarked, in his account of this treatise of Bernoulli's) has very little to do with the main subject of the treatise (the "Tides"), and contains, amongst other things, an attempt to account for that lunar revolution which has been so absurdly denied by some of your correspondents. In this attempt, Bernoulli *assumes* that knowledge of the "interior construction of the moon" which "Indagator" is so much surprised at in Mr. Recordon. He says, "Considérons, donc, que la parfaite homogénéité dans les couches concentriques de la lune aussi bien que sa parfaite sphericité sont *moralement impossibles.*"

"*Moral impossibility*" is, certainly, rather a doubtful foundation for a physical argument (quite as good, though, by the way, as nine-tenths of what has recently been written about the *Plurality of Worlds*); and, even granting it as an axiom, "il n'est pas encore expliqué comment on peut déduire de là pourquoi la lune nous montre toujours une même face," as Bernoulli *naïvely* adds.

To this task he next addresses himself; and the chief cause which he assigns is, "the unequal gravitation of its parts towards the earth; the gravitation being greater in proportion as the parts are nearer to the earth." This amounts, in short, to taking into consideration the *different* distances of different portions of the moon's mass from the earth's centre, and the consequent variations of gravity. "This cause is alone sufficient," says Bernoulli, "when joined to the 'figure' of the moon, to produce the phenomenon in question, '*even were the moon perfectly homogeneous.*'" He proceeds with his attempt as follows:—Let A be the centre of the earth; B C F D, an



ellipse, for example, B F being the major and C D the minor axis; and suppose this ellipse, by revolving round B F, to generate the body of the moon. Suppose the moon homogeneous and movable round its centre, E, and that each particle gravitates towards A, according to the inverse square of the distance from A. "This being established, I assert," says Bernoulli, "that the moon will always turn the same face, C B D, towards A, and that the axis, F B, will always pass through A, and that the moon, if turned aside from this position, would return to it."

"As this matter," says he, "is very interesting both for astronomy and physics, I will explain it by an example which will render what we have said very clear. I say then that we ought to regard, in this respect, the moon as a body floating in a fluid; for the parts of such a body are similarly animated by different forces of gravitation. Now we know that a floating body which is not spherical, or, being so, is not homogeneous, is not indifferent to all situations; but takes a certain position, to which it always returns if disturbed from it. Sometimes the body has only one position of equilibrium; at other times it has several, according to the structure of the body; but we should be mistaken if we supposed the centre of gravity of the body always to seek the lowest possible situation; in the same way we should deceive ourselves if we supposed that the centre of gravity of the moon always seeks to get away as far as possible from the centre of the earth."

After this most luminous and convincing "example," Bernoulli concludes this singular proof thus:—"We see, therefore, sufficiently, that the principal cause why the moon always presents the same face to us, is the inequality of gravity; and to this cause we must join either the want of perfect sphericity or of perfect homogeneity of the strata of the moon, or the two causes together." This is absolutely all the "proof" he gives. It is really marvellous that so acute a man could satisfy himself with such reasoning; or that he could forget the simple fact, that by the very same reasoning he would prove equally well that the *earth* must always present the same face to the *sun*.

That there *is* some physical cause for this phenomenon in the coincidence of the times of revolution round its own axis and round the earth—a coincidence so remarkably extended in the case of other satellites and their primaries—is not to be questioned for a moment. Such attempts have been made recently, but, in the opinion of so competent a judge as Sir John Herschel, "somewhat too hastily" (Astronomy, art. 434 of the 4th edition).

I have trespassed longer than I intended on your space, but the subject is one of considerable interest, as Bernouilli says, "tant pour l'astronomie que pour la physique;" and I hope that some competent mathematician will ere long take up the question and treat it in a satisfactory manner.

I am, Sir, yours, &c.,

A. H.

BETHUNE'S IMPROVEMENTS IN SHIP-BUILDING.

To the Editor of the Mechanics' Magazine.

Sir,—Mr. Bethune's letter in your number of last week certainly calls for some reply from me. I shall not, however, tax to any very great extent your indulgence, as I shall follow Mr. Bethune's example in this particular, and be very brief. Indeed I have very little now to say, for I have already expressed my opinion, and (as I believe) justified it in my former letter.

Mr. Bethune's letter is an attempt to prove the respectability of his invention by means of the evidence of men supposed to be well competent to decide such a question. There is one feature in the letter which I think did not appear in the article in the *Journal of the Society of Arts*; Mr. Bethune seems to have some faith in the success of the invention himself.

The argument with which Mr. Bethune designs to lay me in the dust is rather a curious one, as your readers no doubt have already perceived; for the very particulars which would have rendered it of any weight are most carefully omitted. Mr. Bethune pretends to confound my anonymous criticism by arraying against me the testimony, favourable to his invention, of two eminent ship-building firms and a well-known captain, and with this view he quotes from their letters their *opinions* on the subject; *but he neglects to tell us who they are.* So their opinions are utterly worthless thus brought in argument, as indeed they would perhaps be if their names went with them.

I do not intend, Sir, to appeal to my experience in the profession of ship-building to give weight to what I advance. By way of argument I propose that it shall have no other power than that which it derives from the principles upon which it pretends to be based. I considered, and do so still, that the extracts made from my last letter from the article in the *Journal of the Society of Arts* amply justified my criticism. And I think that had Mr. Bethune the means of showing my professional authority and eminence to be as small as his own, he would not in the slightest degree diminish the weight of my remarks.

In the first authoritative extract which Mr. Bethune makes, there is a parenthetical clause of great significance, viz., (with alterations in dimensions, scantling, and power). It is easily seen that the dimensions may be so altered as entirely to eliminate Mr. Bethune's principles from the construction of the vessel altogether. From this same passage I conclude, that if the ship-building firm to whom it is ascribed, be sincere, they will build the vessel on their own ac-

count, and without delay, for in their own opinion it seems pretty clear it would pay them well; so we look forward to having a steamer in a few months which shall prove or disprove the reasonableness of Mr. Bethune's expectations. On the issue of this experiment, I shall be very glad to leave the discussion on the justice of my criticism.

I have just one remark to make on the depth which the proposed class of vessel is to have. There is a very strong objection against making the extremities of a ship much lower than is usual. It has always been an object to make that portion of a vessel which is above water, as low as is compatible with the purpose for which she was designed, and of course it has been seen that the heights of the forecastle and quarter deck have been those which admitted of the smallest reduction. They require height to keep the ship dry and give her sea-worthy properties. Again, as to the influence that the increased height amidships would have on the qualities of the vessel, I can only say, that to me, there is no doubt whatever, that if this top hamper be made sufficiently heavy to add in any important degree to the strength, it will diminish to a dangerous extent the stability of the ship.

Mr. Bethune says in his concluding remarks, that the letters from eminent practical men can be seen by persons wishing to avail themselves of the improvements. Now I do not wish to try them, so I am still left to wonder who these prudent ship-builders are, and must wait for the appearance of the ship which they evidently intend to build.

I am, Sir, yours, &c.,

J. C.

Deptford, Feb. 27, 1855.

THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

SIR,—Nothing is more vexing than to see very simple and very useful propositions entirely misconceived. After all the clear definitions in your pages, here is Mr. Palmer writing from Marseilles to tell us, on the authority of a child's book, "that the visible gaseous products of an ordinary fire (*not* chiefly tar vapour) are entirely combustible in a practical sense." Who has ever questioned it? Did not Mr. Mansfield inform us that when a child also, he put coal into a tobacco-pipe, and luted it in with clay, and, placing the bowl in the fire, the *smoke*, as he termed the gas distilling through the stalk, could be ignited, tar vapour and all, into a stream of flame? Hardly any child but has accomplished this feat in past days, when "gas" was the new wonder. *How singular,* then, is it not to perceive the correct distinction drawn by Mr. Williams between this gas *before it is consumed*, and the vapour or *true* smoke which ensues *after* it has been *imperfectly* consumed. The gas so issuing from the pipe is perfectly consumed because it has plenty of air; but when gas is distilled suddenly from coal thrown into a hot furnace, with a confined supply of air, then the true *smoke* results. A part of this gas only being inflamed when there is not air enough present for the whole, a compound vapour passes off through the flues, consisting of gases not decomposed at all; carbonaceous particles, or *soot*, liberated from the hydrogen which is decomposed; nitrogen, carbonic acid, and the whole of these, incorporated with a large volume of steam generated from the consumed hydrogen. This constitutes the true smoke issuing from factory chimnies, and in no particular has Mr. Williams done more real service than by pertinaciously (or "pragmatically") discriminating this incombustible compound from the gaseous products distilling, *before combustion*, from the coal, and which are "wholly and entirely combustible in a practical sense."

There is no more important feature respecting furnaces than the consideration of the effects of the *steam* yielded by consuming hydrogen. The forcible admixture of this product with the current in the flues, already lowered in temperature by the great heat abstracted in volatilizing the constituents of the coal, acts as a powerful agent in checking further combustion and promoting smoke. Mr. Palmer makes the extraordinarily crude assertion, that the flame of a candle "is nothing but a pyramid of burning smoke;" let him add, that the flame of an Argand gas-burner is nothing but a cylinder of burning smoke, his assertion will have consistency, and be resolved to the simple proposition that gas *ought* to be termed *smoke*. Some other name in place of smoke being, then, given to the cloud issuing from chimnies, we arrive simply at a change of nomenclature, which he may adopt for his own use, and whether others choose to adopt it or not, we shall at least understand what it means. As to what the flame of a candle is, according to the scientific terms in use, I beg to refer him to your number of the 2nd December last, page 534. In addition to what is there indicated, let Mr. Palmer bring the polished cold surface of a knife-blade within half an inch of the candle flame, and mark the deposition of steam, intercepted and condensed, as it flies rapidly outward into the surrounding air. He will then appreciate the effects of this vapour, when forcibly confined and intermingled with the products of the raw coal in narrow passages, such as the small tubes

of those boilers the evils of whose introduction into the marine service Mr. Williams so amply explains and illustrates in his Treatise. In larger flues it has a similar effect in smaller degree, if the whole gas is not at once converted at the proper point and time. In the "smoke" from the tobacco-pipe, the conical "smoke" of the candle, and the cylindrical "smoke" of the gas-burner, this steam rapidly liberates itself during combustion by its natural expansion. There is a singular oversight in Mr. Palmer's statement, that *cold air* may be made almost to extinguish the flame of a candle. The fiercer burning of a fire in cold weather might have led him to suspect a fallacy. When a candle is supplied with "very cold air," the flame is diminished in brightness, as we have all witnessed in the late intense season, simply by the fact that the tallow or composition becomes so cold, that the heat radiating downward from the flame is not adequate to melt the liquid fuel fast enough to supply the wick. This is the solution of the paradox of a different action of the same cause *upon* the table and *in* the grate. How fortunate would it have been had the "intensely cold air" extinguished the late flames in Holland-street!

Last, on the "hot air" mistake. It is quite true that if a fire be supplied with a given weight of air heated, and with the same weight of air cold, we may assume that the resulting heat in the first case will be so much greater as is the greater quantity of heat brought in with the heated air. But this proposition requires to be correctly applied and reasoned on. Suppose a certain number of diffusion orifices, supplying jets of *cold* air to a furnace. Then let the same *weight* of *heated* air be driven through these apertures. Say the air be heated to 500°, its volume will be doubled; and to furnish the same weight of oxygen, a compression of one atmosphere must be effected. For many practical reasons, I do not consider that the beneficial combustion in the furnace would be increased by nearly all the amount of the 500° of heat previously imparted to the air. But, for argument's sake, grant it would be so. What follows? What bearing will the admission have on any known construction of furnace? None at all. In order to supply the same weight of oxygen for combustion as enters without effort when the air is permitted to be cold, we must have a *compressing* or *blast-apparatus*, ENGINE, or other *power* to work it, and a *heating-apparatus* to heat the air. That is to say, a costly plant and two extra fires for the sole purpose of forcing into the "smoke" air raised to about one-fourth the temperature, which it would instantly assume from its own combustion, if suffered to go in of itself, cold, at the proper time and place. No one has yet suggested such a preposterous "smoke-consumer;" there has been no plan proposed for increasing the caloric of a furnace by "the caloric thus previously imparted to the air." Therefore Mr. Palmer speaks of nothing but of a wasteful exploit which no sane man will ever attempt to perform.

In fact, nothing shows how little he is aware of the true bearings of his own data, than the reference to Juckes's grate. This is the most conclusive of all cases against the hot-air quackery; for there is no furnace in which the air *is* and *must* be introduced so essentially cold as where these grates are used, and yet it is the *most perfect of smoke-consumers*. The bars *must* be kept as *cold as possible*, to preserve the links and coupling-pivots from rupture or distortion. When this grate is well made, and placed where there is a good chimney, with a sharp draught to pass the cold air rapidly in, its success is complete, and it realizes the saving asserted in the *value* of the fuel which it can consume. When properly working, the hand may be placed on the bars without inconvenience; and as there is, therefore, no hot ash-pit to even warm the air, and never any thickness of incandescent fuel for it to pass through, Mr. Palmer has settled the hot-air ambiguity by quoting, in its support, the best known smoke-consumer requiring the coldest known temperature of air. Where there is room to generate the steam from a large boiler surface by a low rate of combustion, and where the great weight of the machinery is no object, this self-feeding, *cold-air* "smoke-consumer" is undoubtedly the best thing yet devised.

I am, Sir, yours, &c.,

DAVID MUSHET.

Feb. 26, 1855.

MR. WILLIAMS ON COMBUSTION.

To the Editor of the Mechanics' Magazine.

SIR,—I beg to assure Mr. Mushet, through your columns, that I did not overlook his previous letter, with reference to "a most important mistake which had crept into the last edition of my work," on combustion. That mistake consisted in my having, in Mr. Mushet's opinion, attributed to Mr. Craddock certain views and statements in connection with the use of tubes in boilers; but which were not borne out by what appeared in Mr. Craddock's published lectures on his steam engine.

So far from overlooking Mr. Mushet's remarks, I immediately wrote Mr. Dircks (his agent in London, and through whom I had been apprised of the alleged mis-

take), asking if he had the memorandum alluded to by Mr. Mushet, or a copy of it, as, being at the time, and long after, confined and suffering under a serious illness, the matter had unintentionally lain over, and I was unable to find it. I would regret having published any misstatement of Mr. Craddock's views or facts; and if Mr. Mushet has a copy of the memorandum, or will be good enough to communicate to Mr. Dircks the terms in which it was conveyed, I will, without delay, request your giving it a place in your columns.

I avail myself of the present opportunity of giving insertion to the following letter, on the subject of Mr. Baddeley's communication in your Magazine, of the 17th ult., page 159. That gentleman having thought it extraordinary I should disclaim the term *Argand*, as applied to my mode of introducing air to furnaces, or my having given it that name, I replied that I could not claim what did not belong to me. The following letter, from Mr. Dircks, will, I trust, satisfy Mr. Baddeley on that head.

I am, Sir, yours, &c.,

C. W. Williams.

Liverpool, Feb. 28, 1855.

MR. DIRCK'S LETTER TO MR. WILLIAMS.

"Dear Sir,—In reply to your esteemed letter, of the 19th instant, I beg to state that it was about 1840-1, when I first adopted the title of '*Argand furnace*,' to distinguish your invention from the numerous schemes for 'smoke-burning.' the term *Argand* has since become as much a conventional or household word as MacAdam or Kyan. Having been transferred from distinguishing a peculiar construction of *oil-lamp*, to designate an improved *gas-burner*, the transition was natural as applied to your furnace; for, as the Argand 'gas-burner' presents jets of gas to a body of air, your arrangement of distributors presents jets of air to a body of gas. This principle was fully discussed and applied in your specification of 1839, and in the first edition of your work on the 'Combustion of Coal.' Since my denominating it 'the *Argand furnace*,' it has been universally known by that, and by no other name.

"I am, Sir, yours, &c.,

"H. Dircks.

"London, 32, Moorgate-street, Feb. 21, 1855."

ELASTIC WOOLLEN CLOTHS.

To the Editor of the Mechanics' Magazine.

Sir,—Has it occurred to any manufacturer of woollen goods to make a material for trousers which, when worn, would not be so liable to become stretched at the knee as the fabrics now in use? Such a manufacture I have no doubt would be among the number of those which meet with success. With regard to the means of effecting this object, the following suggestions may be of use: A thin sheet of vulcanized India-rubber may be attached by cement (if such there be), or otherwise to the reverse side of the material of which the leg of the trouser is made; this will expand and bear the strain consequent upon the bending of the leg, and when the strain is removed, the India-rubber will return to its former position, bringing with it the fabric to which it is attached. Another, and perhaps a better mode is that suggested by the specification of a patent granted in 1833, to Mr. R. W. Sievier, for "Improvements in the making or manufacturing of elastic goods or fabrics," the second object of which patent is "to manufacture in the ordinary loom on elastic woollen cloth by the introduction of cords or strands of India-rubber among the longitudinal threads or yarns which constitute the chain or warp, and also among the transverse threads or yarns which constitute the weft or shoot, and which cloth shall be capable of being afterwards felted and dressed with a nap." Now were this plan of "introducing cords or strands of India-rubber" adopted, an elastic strip, about four or five inches wide, might be woven in the material (as the ornamental strip is at present produced) in such a position, that when made into trousers this elastic strip would pass down each leg in front of the knee, and being felted and dressed with a nap, would not be apparent on the outside, but from its elasticity, would yield to the strain, and when released, return to its former position. Hoping that these suggestions may be of use to some of your readers who are engaged in the manufacture of woollen cloth,

I am, Sir, yours, &c.,

Subscriber.

Feb. 28, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Soresina, Paul Garavaglia de, of Bedford-row, Middlesex. *Improvements in treating flax and hemp.* Patent dated August 2, 1854. (No. 1703.)

This invention consists in subjecting flax and hemp to the percolation of cold water, under pressure, to the action of grooved rollers, steam, &c.

Rye, William, and William Crowther, both of Oldham, Lancaster, engineers. *Improvements in steam-engines.* Patent dated August 3, 1854. (No. 1705.)

This invention relates to the governors of steam-engines, and consists in the employment of a sliding bush and tapered tappets in such manner that when the engine is working at its proper velocity the governor holds the bush in such a position that the tapered tappets impart the requisite motion to the expansion valves, for admitting the regular quantity of steam; but when, owing to the diminished velocity of the engine, the governor balls collapse, the sliding bush of the governor acts upon levers which move the sliding bush, and the tappets are made to increase the traverse of the expansion valves until the engine regains its regular velocity.

TETLEY, CHARLES, of Thurlow-villa, Dulwich, Surrey. *Improvements in rotatory engines to be worked by steam or water.* Patent dated August 3, 1854. (No. 1706.)

This invention consists in combining the parts of rotatory engines "in such manner, that the pressure of the atmosphere shall act on both ends of the axis of such engines, or when one of the ends of a rotating hollow axis of such an engine is subjected to the pressure of the steam or water, the other end of the axis shall be subjected to a like pressure, thus keeping the axis of such engines in a state of equilibrium in respect to end pressure when rotating."

GOSSAGE, WILLIAM, of Widnes, Lancaster, manufacturing chemist. *Improvements in the manufacture of certain kinds of soap and other detergent compounds.* Patent dated August 3, 1854. (No. 1707.)

These improvements mainly consist in the application of solutions of soluble glass to the production of compound soap by mixing them with genuine soap made from rosin, combined with not more than double its quantity of tallow or oil, or of a mixture of tallow and oil.

HALLEN, EDWARD, of Cornwall-road, Lambeth, Surrey. *Certain improvements in chairs, chair-bedsteads, and other seats and bedsteads.* Patent dated August 4, 1854. (No. 1708.)

This invention consists in forming chairs, &c., with sliding-frames or supports, and in making flat iron frames, and filling the same in with a webbing of cane or other material, &c.

MILES, LOUIS PLAYER, of Ravensbourne-park, Lewisham, Kent, gentleman. *Improvements in the construction of locks.* Patent dated August 4, 1854. (No. 1709.)

The inventor constructs his lock with certain spring tumblers combined with another tumbler, called a "regulator," which has a different motion from the others, and is without a spring; it receives the pressure from the springs of the other tumblers, and in case of any attempt at picking it, re-acts upon them, and produces "a combination of difficulties."

TAYLOR, SAMUEL LAWRENCE, of Cotton-end, Bedford. *Improvements in constructing and arranging the beaters and dressing machinery of threshing machines.* Patent dated August 4, 1854. (No. 1711.)

The inventor employs as beaters plates of iron, formed with ridges and fixed with screws, and the grain falls from the straw-shaking apparatus of the threshing machinery on to an inclined platform to which a shaking or vibratory motion is given.

KORTRIGHT, ALFRED, of James-street, Adelphi, Middlesex, commander, Royal Navy. *Improvements in marine and surveying compasses.* Patent dated August 4, 1854. (No. 1713.)

Claim.—The construction of marine and surveying compasses in cast-iron rings or cases, which rings or cases may or may not be electro-typed.

HARRISON, CHARLES WEIGHTMAN, of Richmond, Surrey, electric engineer. *Improvements in obtaining and applying electric currents, and in the treatment of certain products derived in obtaining the same, part or parts of which improvements is or are applicable to the production of motive power.* Patent dated August 4, 1854. (No. 1714.)

Claims—1. The employment of sodium or potassium, in combination with zinc, zinc and mercury, or any other metals whatever, as positive electrodes in galvanic arrangements. 2. The employment of positive electrodes, consisting of an amalgam or compound of mercury and zinc.—3. The employment of an alloy or compound of iron and platinum, as negative electrodes. 4. The employment of negative electrodes formed of divided or partly divided plates or sheets of metal. 5. The construction and use of a certain described concentric galvanic battery. 6. The use in galvanic single-fluid arrangements of a solution of nitrous acid, consisting of equal or nearly equal parts of nitrous acid and water. 7. The use of hypochlorous acid or euchlorine, either as an exciting or secondary agent, or both. 8. The employment of cells or divisions formed wholly or in part of asbestos. 9. The employment of square, flat, or rectangular wires or ribbons in the construction and use of electro-magnets. 10. The employment of bundles of any number of separately uninsulated square, flat, or rectangular wires or ribbons in the construction and use of electro-magnets. 11. The employment in the application of electric currents for producing motive power of a certain "plate horse-shoe electro-magnet." 12. The employment of electro-magnets, with convex or rounded poles or faces, in the production of electro-magne-

tic motive power. 13. A mode of arranging "plate horse-shoe electro-magnets" and keepers, or fixed and movable electro-magnets, whereby a reciprocatory or vibratory motion may be obtained. 14. A circular or cylindrical arrangement of "plate horse-shoe electro-magnets," whereby a continuous rotary motion may be produced. 15. The use of triangularly-formed keepers or armatures in arrangements for the production of electro-magnetic motive power. 16. The employment of square, flat, or rectangular wires or ribbons, in the construction of galvanometer coils for electric telegraph instruments. 17. The use of ferrocyanic acid, in the production of colouring materials from products of galvanic action. 18. The use of chromic acid in the production of colouring-matter or compounds from products of galvanic action. 19. The use of oxides of chromium and salts of cobalt, for the production of green colours or compounds from products of galvanic action. 20. A mode of producing brown colours or compounds from the products of galvanic action.

BOISSONNEAU, AUGUSTE, of Paris, France, oculist. *Improvements in artificial eyes.* Patent dated August 15, 1854. (No. 1715.)

Claims—1. Proportioning the length of artificial eyes in such manner that their caruncular and temporal portions shall not exert pressure upon the corresponding organic parts of their orbit. 2. Making the necessary shortening of the eye for this purpose only in the temporal section. 3. The formation of a notch, perforation, or aperture in the inferior palpebral section of artificial eyes for the purpose of establishing a communication between the interior and exterior thereof, and thus allowing the lachrymal fluid to maintain its proper level in the hollow of the eye, and restoring the functions of the lachrymal canal.

STANSBURY, CHARLES FREDERICK, of the firm of Nourse and Co., of Cornhill, London. *Improvements in machinery for making rope.* (A communication.) Patent dated August 5, 1854. (No. 1716.)

This invention consists in the employment of a ring with cogs on its inner and outer edges, and rotated by pinions working into the exterior cogs, for the purpose of regulating the relative twist of the separate strands and the entire rope, by diminishing, to a greater or less extent, the number of the revolutions of the fliers; and also in the use of clamps for receiving finished rope.

STANSBURY, CHARLES FREDERICK, of the firm of Nourse and Co., Cornhill, London. *Improvements in locomotive and steam boiler furnaces.*. (A communication.) Patent dated August 5, 1854. (No. 1717.)

Claims—1. Conducting off the heavy gaseous products of combustion by means of a pipe connecting the lower portion of the furnace with the smoke-pipe or flue. 2. Surrounding the induction-pipe with a large eduction-pipe, by which means the heat of the escaping heavy gaseous products is imparted to the air entering to supply the fire.

STANSBURY, CHARLES FREDERICK, of the firm of Nourse and Co., Cornhill, London. *Improvements in cut-nail machines.* (A communication.) Patent dated August 5, 1854. (No. 1718.)

This invention mainly consists in combining pairs of fixed stocks and cutters with others which are vibrating, when the latter are so arranged as to be capable of being operated from one lock-shaft by one cam and lever, and the pairs or sets of stocks constitute the griping-jaws for holding the blank whilst it is being headed.

STANSBURY, CHARLES FREDERICK, of the firm of Nourse and Co., Cornhill, London. *Improved air-tight vessels.* (A communication.) Patent dated August 5, 1854. (No. 1719.)

This invention consists in forming, at or near the mouth of vessels which it is intended to render temporarily or permanently air-tight, a groove into which the edge of the cover may pass, and placing a fluid in the groove when the vessel has to be frequently opened, or a composition of gutta percha and rosin, when it is to be hermetically sealed. Also, in an arrangement for preventing the fluid employed as before described, from spilling.

CUNNINGHAM, JOHN, of Beith, Ayr, card-perforator. *Improvements in the preparation or production of printing surfaces.* Patent dated August 5, 1854. (No. 1720.)

These improvements mainly consist in a mode of producing patterns on surfaces or matrices composed of types or pins built up into a regular mass, wherein a depressing apparatus, furnished with prickers or depressers and corresponding finger-keys, and arranged similarly to the well-known "piano" punching-machine for perforating Jacquard cards, is used for depressing portions of the pins or types in accordance with a set pattern.

ALEXANDRE, EDOUARD, organ-builder, of Paris, France. *Improvements in concertinas.* Patent dated August 7, 1854. (No. 1724.)

Claims—1. Supplying organ sound-boards to concertinas. 2. Applying the pianoforte key-board to concertinas. 3. Applying the so-called percussion system to concertinas. 4. Making the sounding chambers of greater depth for the bass than for the higher notes.

Cox, George Addison, of Lochee, Dundee, Forfar, power-loom linen manufacturer. *Improvements in machinery or apparatus for winding yarns or thread.* Patent dated August 7, 1854. (No. 1725.)

Claims—1. A mode of winding yarn or thread by means of horizontally disposed spindles lying upon the peripheries of, and driven by, surface-wheels upon horizontal spindles. 2. A mode of stopping the motion of the spindles of winding machines, when horizontal spindles are used, by means of cams or equivalent mechanical details, arranged to lift or move the spindles out of contact with the surface-driving wheels, on releasing a catch by hand or by the action of the spindle itself when full.

Lucas, Samuel, of Dronfield Foundry, near Sheffield, York, steel-converter. *An improved mode of manufacturing steel.* Patent dated August 7, 1854. (No. 1730.)

The main object of this invention "is to convert bar-iron into bar-steel in the presence of iron ore, which ore will, at the same time, be itself converted into steel."

Waterhouse, Thomas, of Sheffield, York. *Improvements in machinery for cutting files.* (A communication.) Patent dated August 8, 1854. (No. 1732.)

According to one of these improvements (of which there are many), the bed on which the "blank" which is to be cut into a file rests, is made capable both of sliding and turning on an axis, thus allowing the angular position of the "blank" to be varied, whilst the line of action of the hammer and cutter is still retained.

Hulme, Joseph, of Manchester, engineer. *Improvements in apparatus for preventing the explosion of steam boilers, for measuring the pressure of steam and other fluids, and in heating water for the supply of steam boilers.* Patent dated August 8, 1854. (No. 1734.)

This invention consists—1. In fitting to boilers a disc, constructed so as to explode when the steam exceeds a given pressure. 2. In certain improved apparatus for measuring the pressure of fluids, consisting of a piston and weighted lever. 3. In suspending over a fire an open shallow vessel, to which vessel the water to be heated is supplied.

Turner, Henry, of Leeds, leather merchant. *Improvements in preparing hides, and in cutting them into straps for driving machinery.* Patent dated August 8, 1854. (No. 1735.)

Claims.—1. The application and use of a compound of Irish moss and palm oil for preparing hides. 2. Certain improvements in cutting hides into straps by means of a described rotary machine.

Moorhouse, Henry, of Denton, Lancaster, tailor. *Improvements in certain parts of machinery or apparatus used in preparing cotton, wool, or other fibrous materials to be spun.* Patent dated August 8, 1854. (No. 1736.)

This invention mainly consists in the combination of a certain block or presser for the purpose of compressing the fibrous material by its gravitating force, with a can movement for effecting the indraught of the web or sliver, and the disposition of the latter in coils or circular layers by the revolving motion of the can or vessel.

Corvi, Antoine, organ-builder, of Paris, France. *Improvements in musical instruments.* Patent dated August 8, 1854. (No. 1738.)

This invention relates to a system of stringed and wind instruments, so constructed and combined as to imitate the performance of orchestras, when played like barrel or key-board organs. This system comprises amongst others, violins, tenor-violins, violincellos, &c.

Ogg, Alexander, of Glasgow, Lanark, shoemaker. *A new composition applicable to the cementing of leather.* Patent dated August 8, 1854. (No. 1739.)

This composition is formed of a quarter of an ounce of asphaltum, one ounce of gutta percha, and a quarter of an ounce of resin, dissolved in five ounces of bi-sulphate of carbon.

White, William, of York-villa, Kensington-park, Bayswater, consulting chemist. *An improvement in deodorizing the contents of cesspools, privies, and also like matters in other places.* Patent dated August 8, 1854. (No. 1741.)

The inventor employs a powder consisting of charcoal, prepared from night soil combined with vegetable matter, or prepared from the substantive parts of night soil with burned clay and sulphate of the protoxide of iron.

Pitt, William Charles, of Pimlico, Middlesex. *Improvements in the construction of knobs and roses used with locks, latches, and such like fastenings as are constructed with spindles.* (A communication.) Patent dated August 9, 1854. (No. 1742.)

These improvements consist—1. In constructing the knobs of locks or latches with a long neck or collar which fits upon and covers that part of the spindle which projects beyond the sides of the case; and, 2. In forming the rose with a hole through its centre, of the same size as the diameter of the neck or collar of the knob, for the latter to turn or work in freely.

Oulton, Plato, of Dublin, gentleman. *Improvements in obtaining motive power.* Patent dated August 9, 1854. (No. 1744.)

Claim.—"A mode of constructing and combining mechanism so as to be capable of

being kept in motion by the combined action of balls or weights upon the periphery of driving-wheels, such balls or weights being successively returned to their position for acting upon the wheels by means of worm shafts, or their mechanical equivalents."

GILBEE, WILLIAM ARMAND, of South-street, London, gentleman. *Improvements in hydraulic machines.* (A communication. Patent dated August 9, 1854. (No. 1745.)

The patentee describes a peculiar combination of circular chests, arranged one above another, and fitted with pistons furnished with bags, with conical and metallic wire sieves, &c.

JOBARD, JEAN BAPTISTE AMBROSE MARCELIN, of Brussels, Belgium, director of the Museum of Industry at Brussels. *A new system of pump.* Patent dated August 9, 1854. (No. 1746.)

The inventor employs an India-rubber tube, which is compressed by means of an external cam which rolls along it from below upwards, and forces forward the air and water in front of it; the fluid, of course, rises in the tube after the cam has passed, and thus an exhausting and forcing action is produced.

LIVESEY, JOHN, of New Lenton, Nottingham, lace-maker. *Improvements in the manufacture of fringes.* Patent dated August 9, 1854. (No. 1748.)

Claims.—1. A certain combination of machinery, whereby bullion fringes are made, twisted and finished at the same time, and by means of which a larger number of such fringes than usual can be made at once, their united depth being greater than the width of the machinery employed. 2. A certain combination of machinery whereby other than bullion fringes are made and cut at the same time, in combination with a gain of space as in the first claim. 3. A certain arrangement for making fringes, by which additional twist may be put in the material to form the bullion part of the same during the making of it.

HACKETT, JOHN, of Derby, manufacturer. *Improvements in the manufacture of garments, or of appendages or appliances to garments, or parts of garments.* Patent dated August 9, 1854. (No. 1749.)

This invention consists in the employment of leather cloth, or artificial leather, in the manufacture of gaiters, overalls, &c.

CLABBURN, WILLIAM HOUGHTON, manufacturer, of Pitt-street, Norwich. *Improvements in the manufacture of shawls and scarfs.* Patent dated August 10, 1854. (No. 1750.)

The object of this invention is to produce effects similar to those visible in "Tellover" or imitation-India shawls and scarfs. By using the warp (to form a part of the figure) in some instances with a variety of colour, and in others with a single colour, the inventor reduces the number of shuttles, avoids waste of material, and obviates the objection raised against the cutting of the superfluous stuff. In the improved articles, as in the real India productions, the shute is firmly bound in in the process of weaving.

MONSON, EDWARD, of Birmingham, Warwick, daguerreotype artist. *New or improved machinery for manufacturing, cleaning, and polishing daguerreotype plates.* Patent dated August 11, 1854. (No. 1752.)

This invention mainly consists in constructing a machine in which the plates to be operated upon are fixed on a bed moved so as to bring every part of them in succession under the operation of the tools; and in hammering, burnishing, buffing, or grinding and polishing the plates (whether in manufacturing new or cleaning old plates) by means of a hammer, burnisher, and buffs, all of which receive their motion from the same shaft as the bed.

BICKERTON, SAMUEL, of Oldham, Lancaster. *An improved gas-light governor or regulator, which invention is also applicable to regulating the supply of water and other fluids.* Patent dated August 11, 1854. (No. 1753.)

Claim.—1. The construction of a vessel or outer case, similar to an inverted syphon or pressure-gauge one leg of which is exposed to the pressure of the gas or other fluid and the other to the atmospheric pressure. 2. The construction of a float of nearly the same specific gravity as the fluid in which it is suspended, and of such a form that the fluid flowing against the valve, as it passes into the outlet-pipe, shall cause the float to rise, and thus open the valve to an extent proportioned to the quantity of fluid required, and the intensity of the current.

REIMANN, JOSEPH, of Breslaw, Prussia, and FREDERICK SAUERMANN, of the same place. *Improvements in fire-arms.* Patent dated August 11, 1854. (No. 1754.)

This invention relates to needle-guns, and consists in a combination of parts by which the gun is put on full cock, and the cartridge-holder set at liberty, and by means of which the axis of the bore of the cartridge-holder is placed at right angles to that of the barrel.

GREVILLE, PENISTON GROSVENOR, of Lombard-street, London, gentleman. *Improvements in the manufacture of cards for working wool and cotton.* (A communication.) Patent dated Aug. 11, 1854. (No. 1755.)

These improvements consist in employing in the manufacture of cards, woollen or cotton stuff, which is of a thickness varying according to the height of the teeth, but reaches always to the bend of the teeth,

and which is fixed before the manufacture of the cards on the leather or other material employed for the purpose, by means of glue.

Blundell, Walter, of New Broad-street, London, surgeon dentist. *An improved apparatus for treating or preparing any part of the human body requiring to be surgically operated upon, for the purpose of totally or partially benumbing the sense of feeling at the desired part of the human body.* Patent dated August 11, 1854. (No. 1758.)

The principal feature of this invention consists in causing a liquid cooled by ice, or any known freezing mixture, to circulate through a piece of metal, bladder, oiled silk, membrane, or other material of suitable character attached to the apparatus.

Gibson, John, of Paddington, Middlesex, engineer. *Improvements in the manufacture of railway wheels.* Patent dated August 12, 1854. (No. 1760.)

This invention consists in securing tyres upon the bodies of railway wheels, having a dovetail or undercut periphery, by means of ribs or fillets forming part of the tyres, by setting or calking one or both of the ribs or fillets on one or both sides of the dovetail or undercut portion of the bodies at intervals, or with spaces between such settings or calkings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Gathercole, James, of Eltham, Kent, envelope-manufacturer. *Improvements in bordering or producing devices upon the edges of envelopes, letter-paper, or other articles of stationery.* Application dated August 5, 1854. (No. 1721.)

The object of this invention is to substitute for the ordinary hand process employed in the operations named in the title, the common printing process, by which the whole of the parts of the paper to be bordered have the colour printed on them at a single operation.

Johnson, John Henry, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of railway and other wheels.* Application dated August 5, 1854. (No. 1722.)

This invention consists in manufacturing wheels of malleable iron, the material being operated upon in a heated state by means of compressing and combined rolling and drawing-apparatus.

Yapp, George Wagstaff, of Cornhill, London. *An improvement in steam-boiler and other furnaces.* Application dated August 7, 1854. (No. 1723.)

This improvement consists in the employment of a grating, or series of bars, placed at or near the mouth of the furnace, in a perpendicular or slanting position, for the purpose of preventing the fuel from falling or being pushed beyond a certain line until after it has been subjected for some time to the action of the fire in the body of the furnace.

Aubert, Jean Baptiste Toussaint and Fedele Antonio Cossus, of Paris, merchants. *Improvements in obtaining fibre from woollen rags.* Application dated August 7, 1854. (No. 1726.)

The rags being first prepared by teethed and grooved rollers, are afterwards subjected to the action of other rollers on which are rows of points so placed as to pass between other rows on opposite rollers; these latter have motion given to them, so that their points travel in opposite directions, and work immersed in water up to their axes.

Thwaites, John Hall Brock, of Bristol, dentist. *Improvements in apparatus to facilitate the communication by cypher.* Application dated August 7, 1854. (No. 1727.)

This invention consists in employing a series of alphabets which can be arranged from time to time in any order, so that the combination selected for communication may be varied.

Knight, John, of Stamford, Lincoln, engineer. *Improvements in engines to be worked by steam, air, or other fluids or liquids.* Application dated August 7, 1854. (No. 1728.)

The inventor mounts the cylinder of his engine in such manner that it, as well as the piston, is made to reciprocate.

Duguesne, Emmanuel François, of Brussels, Belgium. *An improved mode of manufacturing gas for illumination.* Application dated August 7, 1854. (No. 1729.)

This invention relates to the substitution of bones, and other animal refuse of a like nature, for coal, resin, &c., in the manufacture of gas.

Dircks, Henry, of Moorgate-street, London, engineer. *Improvements in steam-engine boiler-furnaces and other furnaces for the prevention of smoke.* Application dated August 8, 1854. (No. 1731.)

This invention refers to the construction of perforated air-distributing apparatus "in the form of boxes, plates, bars, bricks, tiles, or fire-lumps, made of iron or fire-clay, and placed on, above, and around the furnace-doors, or in any convenient part of furnaces best suited for their introduction."

Stoy, Hugh, of St. John's-road, Battersea-rise, Surrey, yeoman. *Stopping of engines and carriages on railways, and also vehicles of every description on the common roads.* Application dated August 8, 1854. (No. 1733.)

In carrying out this invention, when the speed of the engine or luggage-van is checked, the carriages are to run into it

and meet a projecting-bar thrown out by the driver or guard by means of a rack, and thus to throw breaks into action on the wheels of all the carriages.

WHITE, CHARLES, of Tachbrook-street, Pimlico, Middlesex, paper-stainer. *Improvements in printing-blocks for printing ornamental or decorative paper.* Application dated August 8, 1854. (No. 1737.)

The inventor proposes to employ several slips, each of the thickness of the block, attached together in any simple manner, so that the several slips, or any one of them can be removed at pleasure, and re-arranged so as to form different patterns.

WEBB, EDWARD, of Worcester, hair-cloth manufacturer. *An improved power-loom for weaving horsehair and other fibrous substances, where the weft or shoot is not composed of a continuous thread.* Application dated August 8, 1854. (No. 1740.)

This invention mainly consists of certain means for effecting the to-and-fro traverse of the hook or shuttle of horsehair and other like looms.

KAYE, THOMAS, of Grange-moor, Whitley Lower, near Dewsbury, York. *Improvements in the means of reversing the direction of motion of steam engines.* Application dated August 9, 1854. (No. 1743.)

The inventor employs two two-way cocks, which have separate communications by means of branch pipes with the top and bottom of the cylinder, so that upon imparting motion during any part of the stroke to a lever affixed to one of them, that which before was the eduction will become the induction passage.

LUCAS, JOHN, of Lincoln, agricultural implement maker. *Improved machinery for pulping and reducing vegetable substances.* Application dated August 9, 1854. (No. 1747.)

The inventor employs a hollow roller, the periphery of which is composed of sheet iron, or steel, and punched full of holes from the inside, so as to form a rough surface. The vegetable substances to be pulped are fed to the machine from a hopper, and pressed up against the rough rotating surface by a sliding presser.

UREN, EDWARD WILLS, of Fogginton, Dartmoor, Walkhampton, Devon. *A new or improved machine, and arrangements of machinery, for the manufacturing of bricks, pipes, tiles, and artificial stone from clay and other plastic materials.* Application dated August 10, 1854. (No. 1751.)

This invention primarily consists in the employment of small wheels attached to the shafts of conical rollers for crushing and pugging the clay, but comprises also a variety of apparatus for completing the processes named in the title.

TENNANT, JOHN, of Shields, Monkton, Ayr, farmer. *Improvements in grubbers for agricultural purposes.* Application dated August 11, 1854. (No. 1757.)

This invention consists in fixing to each prong or tooth of the grubber, at a short distance from the point, a pair of lateral teeth inclined backwards and slightly upwards.

*** The documents of No. 1765 are with the law officers under objection.

PROVISIONAL PROTECTIONS.

Dated January 10, 1855.

67. Henry Bessemer, of Queen-street-place, New Cannon-street, Middlesex. Improvements in the construction and manufacture of ordnance.

Dated January 20, 1855.

161. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the construction of seats and similar articles of furniture. A communication from Pierre Scholtus, of Paris, France, piano manufacturer.

Dated January 27, 1855.

207. John Hutchinson, of Longroyd-bridge, Huddersfield, York, engineer. Improvements in apparatus to economize steam.

210. Elias Davis, of Aldgate, London, India-rubber manufacturer. Improvements in rendering paper waterproof.

Dated February 3, 1855.

253. Frederick Samson Thomas, of Cornhill, London, and William Evans Tilley, of Kirby-street, Holborn, Middlesex. Improvements in plating or coating metals.

255. James Timmins Chance, of Birmingham. Improvements in the manufacture of pipes or tubes of glass or other vitreous matter.

257. John Patterson, of Beverley, York, engineer. Improvements in machinery or apparatus for washing, wringing, and mangling or pressing, clothes or textile fabrics.

259. Isaie Lippmann, of Rue Geoffroy Saint Hilare, Paris, France, tanner. An improved method of dyeing or colouring the hides and skins of animals.

261. Thomas Allan, of Adelphi-terrace, Westminster, civil engineer. Improvements in obtaining and transmitting motive power.

Dated February 5, 1855.

263. Godfrey Pattison, of Glasgow, Lanark, merchant. Improvements in machinery for dressing and finishing woven goods or fabrics. A communication.

265. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture or construction of steam boilers or generators, and in the application of materials to such manufacture. A communication from Jackson Brothers, Petin, Gaudet, and Co., of Rive de Gier, France, engineers.

267. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improved mode of preserving railway and other tickets. A communication.

269. Ebenezer Hartnall, of St. Mary Axe. Improvements in preserving animal and vegetable substances for food.

271. Joseph Gibbons, of Oxford-street, Middlesex. An improvement in fixing the spindles of door-locks to their knobs.

273. Thomas Barnabas Daft, of the Isle of Man, esq. Improvements in the manufacture of beds or surfaces to recline or lie on.

Dated February 6, 1855.

275. John Gedge, of Wellington-street South, Middlesex. Improvements in frames suitable for photographic or stereoscopic proofs or portraits. A communication from J. E. Pointeau, of Paris, France.

277. Theophilus Aston, of Compton-street, Regent's-square, Middlesex. Improved apparatus and means for enabling persons conveyed in carriages to communicate with the drivers or conductors thereof.

279. Arthur Warner, of New Broad-street, merchant, London. Improvements in coating or combining sheet iron and steel, with sheet lead, zinc, tin, copper, or alloys of such metals.

281. Peter Smith, of Glasgow, Lanark, machine maker. Improvements in machinery or apparatus for printing textile fabrics and other surfaces.

283. George Audemars, of Lausanne, Switzerland. Improvements in obtaining and treating vegetable fibres.

Dated February 7, 1855.

285. Peter Armand Lecomte de Fontainemoreau, of South-street, London. An improvement in the mode of applying as motive power heated air, combined with the vapour of ether, or of any other liquid easily vaporised. A communication.

286. William Warbrick, of Dukinfield, machine maker, and John Walker, of Compstall-bridge, near Stockport, mechanic, both in Chester. Certain improvements in machines for preparing, spinning, doubling, warping, and dressing cotton, wool, and other fibrous substances.

287. John Grove Johnson, of Basinghall-street, London. Improvements in surgical bandages.

288. George Tomlinson Bousfield, of Sussex-place, Brixton, Surrey. Improvements in steam ploughing machines. A communication from Obed Hussey.

289. Edward Davies, of Liverpool, oil refiner and distiller, of the firm of Davies, Syers, and Co. An improvement in the manufacture of an oil and paraffin, from a material not hitherto used for such purposes.

290. George Tomlinson Bousfield, of Sussex-place, Brixton, Surrey. Improvements in looms for weaving ornamental figured fabrics, and in the construction of the rollers to be used upon the pattern chains of such looms. A communication.

291. Richard Dover Chatterton, of Cobourg, Canada West. Improvements in propelling vessels.

292. Augustus Johann Hoffstaedt, of Albion-place, Blackfriars, and Samuel Blackwell, of Oxford-street. An improvement in powder flasks and shot belts or pouches.

293. George Briggs, of Wigmore-street, Middlesex, carriage builder. An improved spring for carriages.

294. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of spur. A communication.

295. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of constructing dry docks. A communication.

296. William Hartfield, of Prospect-row, Bermondsey, Surrey, tortoise-shell worker. Making book covers in tortoise-shell, inlaid or not with pearl or ivory, and for improvements in machinery for embossing, carving, and inlaying book covers with pearl and ivory, and for making metal joints by which such books may be widely opened; the said improvements to be applicable to inlaying pianofortes.

Dated February 8, 1855.

297. John Wilson, of Manchester, calico printer. Improvements in the manufacture of rollers for printing and embossing calico and other fabrics.

298. Adolphe Girard, chemist, of Pertuis, department of Vaucluse, France. Certain improvements in extinguishing fires.

299. Francis Puls, of Soho-square, Middlesex, chemist. Certain improvements in apparatus to be used in smoking tobacco.

300. Joseph Armstrong, of Normanton Station, Wakefield, York. Improvements in certain parts of the permanent way of railways.

301. George Fergusson Wilson, of Belmont, Vauxhall, managing director of Price's Patent Candle Co., and George Payne, of the same place. Improvements in treating glycerine.

302. Frederick Ransome, of Ipswich. Improvements in drying articles made of plastic materials.

303. Robert James Maryon (engineer civil), of York-road, Lambeth, Surrey. Improvement or improvements in the construction of, and manufacture of, ordnance, part or section of his said invention he applies for improvement in the construction of fire-arms of every class.

Dated February 9, 1855.

304. Charles Armsdell, of Fenchurch-street, London, painter. An improved sifter or shovel.

305. Joseph Martin, of Liverpool, Lancaster, corn and rice miller and merchant. Improvements in machinery for treating wheat and other grain.

306. William Bridges Adams, of Adam-street, Adelphi, Middlesex, engineer. Improvements in the construction and application of elastic springs for sustaining loads or moderating concussion in fixing or moving machines or carriages.

307. John Lees, of Park-bridge Iron Works, Ashton-under-Lyne, Lancaster, and William Heap, of Ashton-under-Lyne, Lancaster, tool maker. A new or improved machine or apparatus for cutting and straightening bars of metal.

308. William Beckett Johnson, of Manchester, Lancaster, manager for Messrs. Ormerod and Sons, engineers. Improvements in steam boilers and engines.

309. Barthélemy Pont, of Rue Bourdaloue, Paris, France, photographic artist. A process of autographic engraving.

310. Francis Parker, of Waterloo, Northampton. An improvement in the manufacture of paper.

311. John Langman, of Plymouth, Devon, architect. Improvements in portable buildings specially adapted to campaigning purposes.

Dated February 10, 1855.

312. Charles Barnard and John Bishop, of Norwich, Norfolk, ironmongers and copartners. Improvements in apparatus for cutting vegetable substances.

314. George Henry Ingall, of Throgmorton-street, City, gentleman. Certain improvements in telegraphic communication and apparatus connected therewith.

315. Samuel Russell, of Porter-street, Sheffield, York. Improvements in projectiles for fire-arms and ordnance.

316. George Hallen Cottam and Henry Richard Cottam, of St. Pancras Iron Works, Old St. Pancras-road. Improvements in the construction of iron buildings.

317. William Balk, of Ipswich, Suffolk, engineer. Improvements in machinery for crushing grain and other substances.

318. Alexander Sands, of Liverpool, Lancaster, ironfounder. An improved fastening or detainer, to be employed as a substitute for "clothes pegs," or for other similar purposes. A communication.

319. Louis Adolphe Ferdinand Besnard, of Paris, France, gentleman. An improved composition for

fixing lithographs and engravings on canvas after being transposed or reproduced by a printing press.

320. Auguste Edouard Loradoux Bellford, of Essex-street, London. Certain materials to be used for cementing and painting, and also applicable to printing and dressing or finishing fabrics. A communication from Professor Frederic Kuhlmann, of Lille, France.

321. George Rennie, of Holland-street, Surrey, engineer. Improvements in marine steam engines.

Dated February 12, 1855.

323. Samuel Smith, of Manchester, cotton-spinner. Improvements in machinery for winding cotton and other yarns or threads.

325. David Barr, commercial clerk, of Dale End, Birmingham. A new or improved tap for hot and cold fluids, steam, and gases.

327. Richard Shirley Harris, of Leicester, gentleman. Improvements in the manufacture of looped fabrics.

Dated February 13, 1855.

329. Samuel Smith, of Manchester, spinner, and Moses Morris, of Swinton, near Manchester, overlooker. An improved machine for spinning cotton and other fibrous materials.

331. Auguste Vallery, of Rouen, France, civil engineer. An improved machinery for the preparation of flax, hemp, and other textile materials.

333. George Dalton, of Lymington, Southampton, gentleman. Improvements in reverberatory furnaces.

DE NORMANDY'S APPLICATION FOR PROLONGATION OF PATENT.

The application of Alphonse Rene le Mire de Normandy for a prolongation of the patent granted to him for "Certain improvements in the manufacture of soap," is to be made on the 2nd of April next, instead of the 12th March, as previously stated. (No. 1644, p. 142.)

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," February 27th, 1855.*)

2221. Alfred Illingworth and Henry Illingworth. Improvements in machinery or apparatus for combing wool and other fibrous substances.

2223. Robert John Chippindall. An improved pencil-case.

2229. George Hamilton. Improvements in obtaining soundings.

2230. John Mason and William Robertson. Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances, part of which improvements is also applicable for shifting straps, by which motion is communicated in other machines.

2233. Howard Ashton Holden. Certain improvements in roof-lamps for railway and other carriages, and for parts used in connection with the same.

2238. John Platt. Improvements in machinery or apparatus for making bricks.

2245. Julius Smith and Frank Sandom Thomas. An improved apparatus for steering ships and other vessels.

2248. John Jamieson. Certain improvements in steam engines.

2250. Bennett Johns Heywood. Improved apparatus for affixing postage and other stamps to envelopes, letters, and other documents.

2252. Edward Abell. An improved instrument to assist the hand in writing.

2253. Henry Hales. Improvements in machinery for propelling vessels.

2254. George Savage. A new or improved singeing lamp.

2261. Charles Cowper. Improvements in preparing to be spun and in spinning silk waste. A communication.

2273. William Thomas Smith and George Hill. Improvements in machinery or apparatus for winnowing, washing, sifting, or separating corn, gravel, minerals, and other materials.

2282. John Healey, John Foster, and John Lowe. Improvements in machinery to be used for drawing, moulding, forming, and forging articles in metal.

2283. Joseph Eccles. Improvements in machinery for the manufacture of bricks.

2285. Peter Armand Lecomte de Fontainemoreau. Improvements in bleaching, dyeing, and preparing hemp and flax to be spun. A communication from Messrs. A. and H. Six, of Wazemmes-les-lille.

2293. William Boutland Wilkinson. Improvements in the construction of fireproof dwellings, warehouses, and other buildings, or parts of the same.

2297. Edward Lindner. Improvements in revolving breech fire-arms and magazine.

2316. Archibald Craig. Improvements in the manufacture of railway wheels.

2319. George Taylor. Certain improvements in mills for grinding corn and other substances.

2321. James Rae. Improvements in machinery or apparatus for assisting in propelling vessels.

2333. Isidore Alexandre Moineau and Jean Gustave Lemasson. Improvements in elastic mattresses and seats.

2334. Edouard Alexandre. Improvements in organ pianos.

2338. John Adcock. The novel application of the stem or stalk of the tobacco leaf for various useful purposes.

2343. Joseph Betteley. Improvements in the construction and manufacture of iron knees, and the application thereof for ships' fastenings.

2408. Lancelot Kirkup. Improvements in anvils.

2413. Pierre Joseph Meeus. A new or improved wind instrument. A communication.

2448. Théodule François Calard. Certain improvements in bedsteads.

2483. John Davie Morries Stirling. Improvements in the manufacture of metallic tubes.

2507. John Taverner. A new edible compound.

2508. Thomas Knight and Stephen Knight. Improvements in apparatus for heating water for baths and other purposes.

2579. George Aubury and William Richard Bridges. A portable apparatus for the manufacture and supply of gas.

2689. Thomas and Samuel Baker. Improvements in the mode or method of lifting or lowering weights or heavy bodies by steam or hand power.

2722. Benjamin Bishop and Joseph Dyer. Improvements in the manufacture of hinges.

67. Henry Bessemer Improvements in the construction and manufacture of ordnance.

176. James Fenton. Improvements in the manufacture of axles, shafts, rods, and bars.

178. Richard Laming. Improvements in obtaining and combining ammonia.

190. Alexander William Anderson. Improvements in posting or exhibiting advertisements.

193. George Henry Bursill. Improvements in cases or coverings for explosive substances or compounds.

237. James Howard. Improvements in ploughs.

250. George Ritchie. Improvements in beds or mattresses.

255. James Timmins Chance. Improvements in the manufacture of pipes or tubes of glass, or other vitreous matter.

263. Godfrey Pattison. Improvements in machinery for dressing and finishing woven goods or fabrics. A communication.

283. George Audemars. Improvements in obtaining and treating vegetable fibres.

284. John Grainger. Improvements in the manufacture of pantiles.

287. John Grove Johnson. Improvements in surgical bandages.

290. George Tomlinson Bousfield. Improvements in looms for weaving ornamental figured fabrics, and in the construction of the rollers to be used upon the pattern chains of such looms. A communication.

295. Alfred Vincent Newton. An improved mode of constructing dry docks. A communication.

301. George Fergusson Wilson and George Payne. Improvements in treating glycerine.

312. Charles Barnard and John Bishop. Improvements in apparatus for cutting vegetable substances.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed February 23, 1855.

1883. George Burch.
1886. James Lamb Hancock.
1889. Thomas McNally.
1927. James Parker.
1966. Julian Bernard.
1974. Thomas Clowes.
1980. Samuel Szontagh.
1999. Alfred Wilson and George Wilson.
2041. William Hodson.
2158. William Johnson.
2180. Edward John Seville.
2442. George Tomlinson Bousfield.
2596. George Taylor.
2624. Samuel Fisher.
2627. Thomas Haines.
2630. James Redgate, James Thornton, and Edwin Ellis.
2638. James Rose.
2663. Robert Von Seckendorff.
2726. John Nash.
2730. William Edward Newton.
2740. William Ward.

Sealed February 27, 1855.

1893. John Fisher Williams.
1914. James Danks.
1919. Henry Bernoulli Barlow.
1920. Nicholas Callan.
1930. William Hill.
1936. Jacques Françoise Henry Hypolite Hervé de Lavaur.
1940. Samuel Stocker.
1958. John Jones.
1982. Martin Billing.
2008. Andrew Barclay.
2440. John Macadam.
2525. Joseph Whitworth.
2595. Joseph Alfred Nicholson.
2686. Richard Whytock and Thomas Preston.
2702. John Hunt.
2736. John Cockcroft.
2739. James Murdoch.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
Feb. 10	3683	Mége and Zaehns-dorf	Frith-street	Bracelet Clasp.
13	3684	Clark and Timmins	Birmingham	Lamp Iron.
20	3685	Price's Candle Company	Vauxhall	Stove Lamp.
21	3686	Oakes and Ward	Birmingham	Lamp Handle.
22	3687	Smith and Ashby	Stamford	Mill Frame.
23	3688	Price's Candle Company	Vauxhall	Stove Lamp.
26	3689	Hinks and Wells	Birmingham	Penholder.

LIST OF PROVISIONAL REGISTRATIONS.

Feb. 7	637	R. Jacobs	Charing-cross	Parasol Joint.
10	638	W. Graham	Cheapside	Brace Ends.
17	639	W. B. Flint	Birmingham	Shutter Bar Clip.
19	640	Harris and Sons	Long Crendon	Sail Needle.
20	641	E. B. B. Wren	Tottenham-court-road	Camp Arm Chair.

NOTICES TO CORRESPONDENTS.

S. Barton, Derby.—Mr. Nicholson makes no exclusive claim, we believe, to the use of the double pall, except when it is employed in combination with the other parts of his stock.

A Thirty Years' Subscriber.—We believe the Specification of Mr. Callan's patent for a new battery will be made public this day (Saturday, March 3rd). If so, we shall shortly publish a description of it. We will endeavour to answer your first question more fully in our next.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

1.] SATURDAY, MARCH 10, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

WILLIAMS'S PATENT SCREW PROPELLER.

Fig. 1.

Fig. 2.

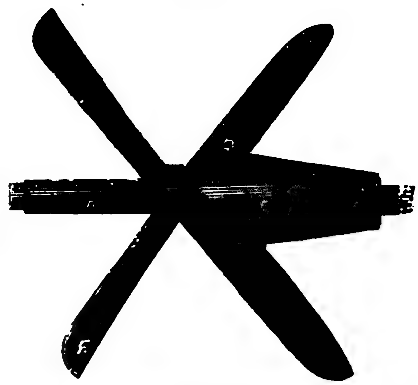


Fig. 3.

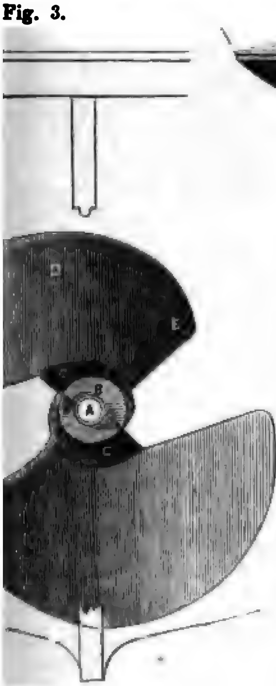
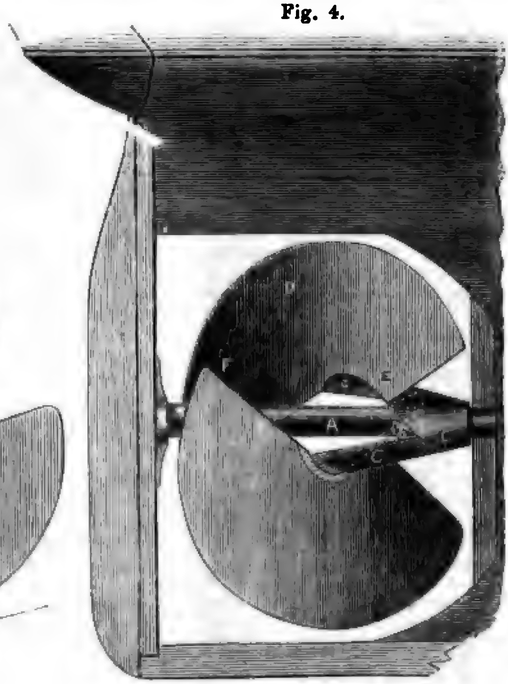


Fig. 4.



WILLIAMS'S PATENT SCREW PROPELLER.

(Patent dated May 10, 1854.)

Mr. W. Williams, of Dublin, has patented a screw propeller, formed by the combination of blades or fans of a particular form, with a conical axis which has an opening or channel through it for the passage of the water after it has been acted upon by the propeller.

Fig. 1 is an end view of the propeller detached, as seen from the front; fig. 2 a side view of it, showing an edge view of the fans or blades; fig. 3 an end view of it, applied to a vessel, and as seen from behind; and fig. 4 a side view of it, showing the openings in the conical tube more plainly than in fig. 2. "A is the ordinary horizontal shaft; B is a boss fixed upon this shaft, and filling the space between it and the inside of the conical tube, C. This boss has grooves or channels, *b*, formed upon it, to facilitate the passage of the water from the centre of motion of the propeller; the conical tube, C, has also openings or channels, *c*, cut or formed in it for the same purpose. These openings or channels, it will be seen from fig. 4, are of considerable size, so as to admit of a clear passage of the water away from the propeller after it has been acted upon by the latter. D D are the fans or blades which are to be fixed to the conical tube, C, by means of angle iron and rivets, as shown, or they may be united thereto in any convenient manner. The form of these fans or blades, it will be seen, is not truly spiral, the fore part, as at E, leading from the outer line of the conical tube, C, to the hinder part, F, in such a manner as to increase gradually the angle made by the inner side of the fan or blade with the shaft, A."

This propeller may, of course, be constructed in various ways; but the inventor prefers that both the conical tube and the fans or blades should be formed of malleable iron, and united together and to the boss by means of angle iron and bolts or rivets, or in any manner that will admit of fixing the fans or blades while at sea.

PROFESSOR FARADAY ON MAGNETIC PHILOSOPHY AND THE PHILOSOPHY OF FORCE.

The inquisitiveness of the human mind has no bounds. The questions How? and Wherefore? are continually proposed, and from every answer given, new interrogatories spring. It seems altogether impossible to satisfy, at least through her own agency, the intense desire of the soul to possess a full and perfect knowledge of the wonders and mysteries in which she is embosomed. All the toil that this desire has urged men to perform seems rather, by the exercise of their faculties, to have increased the longing, than in any degree to promise its appeasement. From every truth we acquire, numberless new questions arise and await our solution, so that, in gaining an increase of knowledge, we are but witnessing the removal of a veil which concealed a larger ignorance and a wider field of labour than we before beheld.

Thus as we toil on, augmenting our stores of knowledge and experience, while we increase the number of the things that we know more or less partially, we become conscious that we are adding much more to the number of those of which we are utterly ignorant. A piece of wood, in burning, is felt to spread its rays of heat through its neighbourhood; and when we ask how this phenomenon is produced, the chemist, who has done his best to discover all about the matter, comes forward and tells us that the oxygen of the atmosphere has a great attraction for the constituents of the wood—that by virtue of this attraction, it combines with them, —and that, in the combination thus formed, the latent heat which was essential to their separate existence is not needed, and is therefore given off during the process of combustion. This, though useful information, so far from satisfying our curiosity, leads us to wonder and to question more than ever. The fact that this oxygen gas plays the part it does in the process is quite as fruitful a source of astonishment, and is quite as inexplicable to us, as the phenomenon of combustion itself. Thus, after a while, we find that in what we at first received as a full explanation of the matter, the chemist has only presented us with details, each of which is as mysterious as that of which we sought an explanation; and our original riddle has but been resolved into a number of others, each as difficult as itself. Though we have gained what it is important for us to possess, and what may be turned to our advantage, we certainly have not found what we sought.

Again, we ask why the parts of a solid body cling so obstinately to each other? and the natural philosopher furnishes us with his reply, but in it gives us no more than the scientific name which he has given to the cause of the phenomenon, and the phe-

nomenon itself, stated in systematic terms. He informs us that the molecules of the body have for each other an attraction which is brought into operation, and exerts its influence, only when they exist in close proximity to each other, and that it is by virtue of this force of attachment that they hold together in an aggregated form, resisting separation. To do thus much is, of course, to do us a service, yet it is no more than making a clear and systematic *statement of the fact*, not a method of accounting for it.

Then there is the apple falling to the earth, exciting the mind to inquiry—to ask why it is that all terrestrial bodies, when left to themselves without support, should always move on the downward road. All know how Newton, pondering on this question, came to the discovery, not why bodies fall, but that all bodies move or tend to move towards each other—that is, that by a universal law, every particle of matter attracts every other particle, and endeavours to bring itself in contact with it. The merit of this discovery lay, not in showing the nature of the cause of the falling of the body, but simply in establishing its identity with that which regulates the motions of the planetary bodies in space; but here, again, we find nothing more than a *philosophical statement of the fact*.

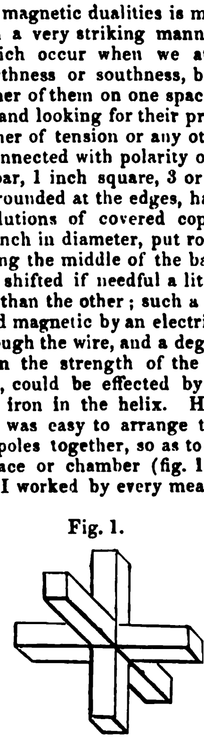
Magnetism is as great a marvel to us as anything that has yet been mentioned, and is probably a greater, from the fact that its manifestations are at present found only in a certain not very wide class of substances; and it is with the researches of Professor Faraday into the nature of the magnetic force, and its relation to physical force generally, that we have to do at present, basing our remarks upon the abstract of a lecture on the subject, which we recently had the pleasure of hearing him deliver, at the Royal Institution; and upon a paper of his, in the February number of the *Philosophical Magazine*, together with such other of his productions as we may find it necessary to refer to.

Before proceeding further, however, we think it necessary to remark, that there seems to be some danger of misunderstanding these writings, on account of a want of strictness in the use of terms, of which Mr. Faraday is certainly guilty. But as examples of this laxity in the use of language will come before us hereafter, we shall not enlarge upon it here.

The *dual* or double character of magnetism is a favourite subject of Mr. Faraday's, and has received considerable attention in the papers before us. Several experiments are cited, which, it is alleged, prove that the two phases of the magnetic forces are inseparable; that is, that no substance exists, or can exist, which will manifest either of the two magnetic forces alone, and without its counterpart; though how some of these experiments connect themselves with this dogma at all, is, to say the least, not very clear. We will quote the following instance from the *Philosophical Magazine*, in the author's own words:

"The essential relation and dependence of the two magnetic dualities is manifested, I think, in a very striking manner, by the results which occur when we attempt to isolate northness or southness, by concentrating either of them on one space or piece of matter, and looking for their presence by effects, either of tension or any other kind, whether connected with polarity or not. A soft iron bar, 1 inch square, 3 or 4 inches long, and rounded at the edges, had thirty-two convolutions of covered copper wire, ·05 of an inch in diameter, put round it, so that covering the middle of the bar chiefly, it could be shifted if needful a little nearer to one end than the other; such a bar could be rendered magnetic by an electric current passed through the wire, and a degree of adjustment, in the strength of the N and S extremities, could be effected by this motion of the iron in the helix. Having six of these, it was easy to arrange them with their like poles together, so as to include a cubical space or chamber (fig. 1), and in this space I worked by every means at my disposal.

Fig. 1.



Access to it was easily obtained by a previous removal of a portion of the solid angles of the ends which were to be brought together, or by withdrawing the electro-magnet a little the one from the others, and then a ray of light could be passed into or across it; magnetic needles or crystals of bismuth could be suspended in it, a ring helix could be introduced and rotated there, and the motions of anything within could be observed by the eye outside.

"A small magnetic needle hung in the middle of this space gave no indication of any magnetic power. Near the open edges and angles vibrations occurred, but they were as nothing compared to the powerful

indications given outside the chamber; even when the needle was many inches away, a crystal of bismuth was entirely indifferent.

"A piece of soft iron, hung on a jointed copper wire within the chamber, showed no trace of magnetic power, whether examined by the little needle or in any other manner. Iron-filings, on a card across the chamber, were not affected in the middle part, but only near the partly open angles. A ring helix of many convolutions, having its terminations passing out at opposite corners, was connected with a very sensitive galvano meter and rotated; it showed no trace of inductive action. Numerous other experiments were made, but with results altogether negative. Attempts (though desperate) were made to ascertain if any electro-chemical conditions were inducted there, but in vain. Every kind of trial that I could think of, not merely by tests of a polar character, but of all sorts, were instituted, but with the same negative result.

"It was of course not to be expected that any polar, that is, any dually related polar action, could be related in this place; but if the polarities can exist without mutual relation, we might surely expect some condition, some tonic or static state in a chamber thus prepared and surrounded with a high intensity of magnetic power, acting in great concentration on one particular spot or sub stance. But it is not so, and the chamber offers a space destitute of magnetic action, and free, under the circumstances, from magnetic influence. It is the complete analogue of the space presented within a deep metallic vessel or globe when charged with electricity. There is, then, no electricity within, because that necessary connection and dependence of the electric duals, which is essential to their nature, cannot be. In like manner there is no appearance of magnetic force in the cubical chamber, because the duals are not both there at once, and one cannot be present without the other."

The meaning of this experiment seems very difficult to discover. How it could be expected to prove either that the polarities of a magnet are, or that they are not inseparable, is not readily perceived. If it has any connection whatever with the conclusion that Professor Faraday comes to on the matter, we think his language must conceal it, for it certainly does not reveal it. To the unsophisticated this experiment would merely prove that six magnets placed symmetrically, about a given point, destroyed, or more properly counteracted, each others' effects; and it would not at all seem to them to prove that the north were inseparable from the south poles. The question to be tried is—can a substance be found that shall have the properties which reside in either of the poles of a magnet, without at the same time possessing those of the other poles of the magnet? To determine this, six magnets are taken, each known to possess both polarities, and although, from experiments with these, no other results are obtained than might have been foretold would be arrived at, in consequence of the existence of these polarities, Professor Faraday, nevertheless, says that these results are capable of deciding the inquiry. But we have still to ask how?

The readiest explanation of all the phenomena associated with what have been called *chambers of weak magnetic action*, is contained in supposing, not that the powers of magnetic attraction that appear to surround them are non-existent, but that they are in full action, but operating in opposing and neutralising the effects of each other, and (as the experiments show) that this balance of power is perfect at one point only. This point, in the case of the cubical chamber and the equal magnets, is the centre of the cube. The experiments prove, too, as might be anticipated, that as we recede from this point in making observations, manifestations of magnetic power appear and reach their maxima on the outside of the chamber.

The following consideration in connection with gravitation, would lead one to regard the authority of these experiments as still more unimportant: Let us suppose the earth to have a hollow space, of the form of a sphere, say, whose centre shall be coincident with the centre of gravity. Now, any heavy body placed in the centre of this cavity will stand in the same relation to the force of gravitation as does the magnetic needle, when placed in the magnetic chamber, to the magnetic attraction; that is, there will be no indication of force at all in it. Yet it would not be proper to say that the particles of the earth have no attraction for a body in such a situation, nor could such an experiment be said to prove that the attraction of gravitation cannot exist as a non-dual force. The fact seems to us to be that, if the north poles were separable from the south, and if they could be brought into proximity with each other, after separation, in the manner described, ordinary people would expect the manifestation of those very results which are said to prove their inseparability.

The only experiment we have ever heard of having any bearing on this question which we are capable of conceiving, is that of dividing the magnet at its equator, and showing that that part which one might have expected to find possessing the properties of the north pole alone, actually

manifests those of the south pole also, the south being situated in the extremity which was previously joined to the other half of the original magnet. This division being continued, shows that every particle of a magnet is more or less magnetic, and possesses, in a higher or lower degree, the whole of the properties which are manifested by the mass which they compose.

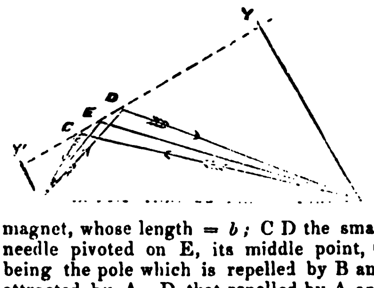
Another striking feature of Professor Faraday's magnetic philosophy is presented to us in his "Physical Lines of Magnetic Force." He imagines that the polarities are related necessarily, not only by their connection by the magnetic body in which they are resident, but that they are also connected by lines external to the magnet (and therefore curved), through which lines, by means of some physical medium, they feed and sustain each other's strength. We will just notice briefly the facts and experiments which have suggested the existence of such lines, and afforded some supposed probability to the hypothesis. So far as we can understand, the argument stands thus:—The polarities are necessarily related and in communication the one with the other, and they must keep up their communication either in right lines through the magnet, or in curved lines without it. Experiments show that the internal arrangement of force is not affected by the presence or absence of other magnets while the forces in external lines are so affected. We, of course, may be mistaken, but we cannot but think that it would take a great number of arguments like this to raise a very small authority. It is not easy to see the *necessity* for any means of communication further than that formed by the proximity and cohesion of particle to particle. We quote the following exposition of lines of force from one of Professor Faraday's lectures at the Royal Institution. He says: "The term line of magnetic force is intended to express simply the direction of the force in any given place, and not any physical idea or notion of the manner in which the force may be there exerted; as by actions at a distance, or pulsations, or waves, or a current, or what not. A line of magnetic force may be defined to be that line which is described by a very small magnetic needle, when it is so moved in either direction correspondent to its length, that the needle is constantly a tangent to the line of motion; or it is that line, along which, if a transverse wire be moved in either direction, there is no tendency to the formation of an electric current in the wire, whilst if moved in another direction there is such a tendency. The directions of these lines about and between ordinary magnets is easily represented in a general manner by the well-known use of iron filings."

The following paragraph from the same lecture is not quite so intelligible:—"The general conclusions are, that the magnetic lines of force may be easily recognised and taken account of by the moving wire, both as to direction and intensity, within metals, iron or magnets, as well as in the space around; and that the wire sums up the action of many lines in one result, that the lines of force well represent the *nature, condition, directions*, and *amount* of the magnetic forces. That the effect is directly as the number of lines of force intersected, whether the intersection be direct or oblique; that in a field of equal force, it is directly as the velocity, or as the length of the moving wire, or as the mass of the wire; that the external power of an unchangeable magnet is *definite* yet *illimitable* in extent; and that any section of all the lines of force is equal to any other section. That the lines of force within the magnet are equal to those without, and that they are continuous with those without, the law of force being closed curves."

This paragraph totally masters our comprehension. We cannot see how a *line* can be said to possess *intensity*, nor how such a line can "*represent the nature of a force*:" nor how we can speak about the *number* of such lines which a wire intercepts when the number which may be conceived in any given space is indefinite,—nor how the number of these lines outside the magnet can be estimated and proved equal to the number within it.

Why, these lines do not necessarily denote the *direction* of the magnetic force any more than the direction of a scale's beams denotes that of terrestrial gravitation. It may be readily shown, that the small needle mentioned in the above definition of a line of magnetic force, may assume the series of positions there mentioned, by virtue of attractive and repulsive forces, acting in straight lines passing through the poles of the magnet. Let A B (fig. 2) be the dominant

Fig. 2.



magnet, whose length $= b$; C D the small needle pivoted on E, its middle point, C being the pole which is repelled by B and attracted by A; D that repelled by A and attracted by B. Then we may regard C D as a lever whose fulcrum is E, and which

is acted on by the four forces, $\frac{P}{BD^2}$ in the direction D B, $\frac{P}{BC^2}$ in the direction B C, $\frac{P}{AD^2}$ in direction A D, and $\frac{P}{AC^2}$ in the direction C A. The needle will here assume such a position for that of equilibrium as will make the resultant moment of these forces about the point E vanish. We may suppose C D so small, that the lines B C and B D, as well as A C and A D, may be considered parallel. We may not, however, regard C D as so small as to make the attracting and repelling forces practically equal, because in that case the needle would rest in any direction in which it might be placed.

Let BY and AY′ be perpendiculars from B and A on the direction of CD. Suppose $BY=p$, $AY=p'$. $BE=r$, $AE=r'$, $CE=DE=a$.

Then
$$BC=r+a\frac{dr}{ds}$$
$$BD=r-a\frac{dr}{ds}$$
$$AC=r'+a\frac{dr'}{ds}$$
$$AD=r'-a\frac{dr'}{ds}$$

and the equation of moments is

$$\frac{p}{r}\left\{\frac{1}{\left(r+a\frac{dr}{ds}\right)^2}+\frac{1}{\left(r-a\frac{dr}{ds}\right)^2}\right\}=\frac{p'}{r'}\left\{\frac{1}{\left(r'+a\frac{dr'}{ds}\right)^2}+\frac{1}{\left(r'-a\frac{dr'}{ds}\right)^2}\right\}$$

or,
$$\frac{p}{r}\,\frac{r^2+a^2\left(\frac{dr}{ds}\right)^2}{\left[r^2-a^2\left(\frac{dr}{ds}\right)^2\right]^2}=\frac{p'}{r'}\,\frac{r'^2+a^2\left(\frac{dr'}{ds}\right)^2}{\left[r'^2-a^2\left(\frac{dr'}{ds}\right)^2\right]^2}$$

The geometrical equations between r, p, r', and p' are readily determined; but the eliminations are not so easily performed.*

We have, however, said enough to show that there is very little foundation for supposing that the direction of the needle indicates the direction in which the magnetic force acts. Whether the lines described can represent the *nature* of magnetic force, or whether lines of any kind are capable of representing the nature of any force whatever, are questions upon which we need not here enter.

(*To be continued.*)

ON STEAM AND SAILING COLLIERS.

A paper on the above subject was read on the evening of Tuesday, February 27, at the Institution of Civil Engineers, by Mr. E. E. Allen. The first section of it was devoted, principally, to a comparison of the original cost and working expenses of screw and sailing colliers. The details of their construction being a distinct subject for inquiry, was only so far noticed as they differed slightly in the case of screw vessels, according to the mode of ballasting. It appeared, however, to be generally agreed, that they should be fully rigged and be capable of steaming full seven knots per hour;—but a higher speed might be advantageous, under certain states of the tide at the various ports.

From certain particulars which were read, respecting the quantity of coals delivered in London, it was concluded, that the screw colliers carried about double the average cargoes of sailing colliers, and were capable of making three times the number of voyages per annum:—one screw collier being, therefore, equal in capability to six sailing colliers.

Comparisons were then instituted between the original cost and working expenses of six sailing colliers, each carrying an average cargo of 300 tons, and making 10 voyages per annum, and a screw collier carrying 600 tons, and making 30 voyages per annum. As good wooden vessels, suitable for colliers, were always to be bought

* For a more complete investigation of the above problem, in which rectangular co-ordinates are employed, see a paper by our correspondent "A. H.," page 206, Vol. XLV.

for £1,200 to £1,800, and iron screw colliers, in ordinary times, at £9,000 to £10,000,—the original cost might be taken as about equal. It was stated, from actual experience, that the working expenses of six sailing vessels would amount to £6,420, and for one screw collier to £5,050 per annum, these sums including all expenses, and giving about 1*s.* 6*d.* per ton, or 20 per cent. in favour of the one screw collier, on the 18,000 tons supposed to be delivered in each case.

It was next considered to what extent the cost of transit would be diminished, by increasing the number of voyages per annum, and a table was given, showing the additions to the working expenses for 12 and 14 voyages for sailing vessels, and 34 and 38 for screw colliers, and exhibiting a reduction of the costs of transit from 7*s.* 1*d.* to 6*s.* 8*d.* and 6*s.* 4*d.* per ton by the former, and from 5*s.* 7*d.* to 5*s.* 2*d.* and 4*s.* 10*d.* in the latter case; still being a saving of about 1*s.* 6*d.* per ton, and equal in the last case to 25 per cent.

It was next shown how the cost of transit by sailing vessels was varied, by their being insured at Lloyd's, or in Clubs; by being ballasted in the ordinary way, or by water; and by being discharged by coal whippers, or by steam cranes; and tables were given, showing the saving effected by working both sailing and screw colliers, under all the different circumstances described, the various combinations resulting in eight systems of working. Tables were also given combining the several systems of working with the varying number of voyages, and the result showed, that sailing vessels, worked on the most improved plan, could bring coals from Newcastle to London at 5*s.* 3*d.* per ton and screw colliers at 3*s.* 6*d.* per ton; being a saving of 33 per cent. The cost was taken at the present high rates both of wages, provisions, and stores, and might be considered as being about 20 per cent. above the average prices.

The paper then described the various modes of ballasting now in use;—ordinary sand-ballast; bag water-ballast; bottom water-ballast; hold water-ballast; and tank water-ballast. The three first only were at present employed in colliers. The fourth plan, of having a water-hold, was described as being adopted in two colliers now building by Messrs. J. Scott Russell and Co., and had been already used with success in the *Pioneer* and *Imperial* screw steamers. In reviewing these methods, both the cost and the time occupied in working them were considered.

Vessels took about one-sixth of their average cargoes in ballast, and the cost of sand ballasting was usually estimated at 3*s.* per ton in sailing vessels, and if used in screw vessels would be 5*s.* per ton; this, however, included allowance for loss of time. The bag water-ballast, invented by Dr. D. B. White, of Newcastle, was then described, and samples were shown of the materials used and the mode of joining, &c. The first cost was stated to be about 50*s.* per ton, and the saving by its adoption about 6*d.* per ton on the quantity of coals delivered. The first cost would be saved in one year, or a year and a half, regular working. The bags were described as being arranged on the floor of the vessel, and connected with a canvas hose, communicating through the side of the vessel, by a large stop cock, with the external water, which ran in and filled them when required. In discharging them, the water was let into the hold, and then pumped out with the bilge water, by the ordinary pumps, or by a pump especially designed by Dr. White for the purpose. A model of the latter was shown, and it appeared that the water was always delivered at the level of the water outside the vessel, instead of being raised to the deck as by ordinary pumps; thus saving on the average three-fifths of the labour in lifting.

Bottom water-ballast was described as the method of adding a second bottom, or ceiling to iron vessels, and filling the intermediate space with water; the first cost was stated to be about £2 per ton on a vessel (builder's measurement), which for vessels carrying 600 tons of cargo, would amount to about £1,000 to £1,200; this giving about £6 per ton of ballast.

Hold water-ballast was described as consisting of an iron water-hold, placed amidships, and capable of containing from 200 to 250 tons of water. The covering of iron plating being fitted with an iron hatch, with a water-tight cover; the plating being decked over. The hatch was made large enough to allow of the hold being used for cargo. On this plan from 30 to 40 tons of water was carried under the forecastle, which had a caulked ceiling, and an iron man-hole arranged for the purpose. The first cost of this plan would probably not exceed £2 per ton of ballast, where this quantity was required.

A comparison was instituted between the first and yearly cost of 100 tons of bag and 100 tons of bottom water-ballast applied to an iron vessel; and the result was, that bag-ballast, fitted under flaps, as tried in the *Northumberland*, cost yearly about £100, or £1 per ton per annum; and bottom water-ballast about £1 10s. per ton; the double bottom giving, however, great additional security, and compensating for the increased

cost,—a reduction of 10s. per cent. on the insurance, if made, being sufficient to cover it.

The advantages likely to result from extending the use of screw colliers in coaling such a station as St. Vincent, one of the Cape de Verd Islands, were then discussed; and it was urged, as an interesting and important matter, to determine whether coals for the out and home voyages between England and Australia, could be advantageously carried in a very large and peculiarly-constructed vessel, at the rate of 15 knots per hour, or whether the capital expended in the part of the vessel intended for the coals could not be better employed in the construction of screw colliers, calculated to make, either by sail or steam, about 7 or 8 knots per hour. It was calculated that a complete and efficient coaling station could be established at St. Vincent's, and vessels constructed for delivering 8,000 tons per annum, for about £50,000; the vessels not being nearly fully employed. The cost of coals at St. Vincent's being thus reduced to about 30s. per ton, and probably, by a similar arrangement at the Cape of Good Hope, to 50s. per ton.

It was urged, that the additional cargo room given by coaling on the way out and home, instead of taking a large stock from England, was of vital importance; and it was argued, that shipping only 6,000 tons of coal in England, and making up at St. Vincent and at the Cape, the saving on 2½ voyages of a very large steamer, for the year, would be about £100,000. This calculation supposed the coaling stations to be properly established, and a full cargo of goods to be obtainable. The case of the *Crœsus* was cited, as having taken 1,000 tons of coal for her outward voyage, and 400 tons of patent fuel for the return, and the fallacy of the saving said to have been effected by this arrangement was pointed out. All notice of the loss of freightage being omitted, shipments being good at the time, and the freight being £7 per ton. It was argued that, with proper stations established, a gain of £3,000 on the voyage would have resulted from her shipping only 500 tons of coal at Southampton.

A table was given, showing the profit which would result from coaling 2,000 tons on different plans, either wholly in England at 15s. per ton, down to 500 tons in England at 15s., and 500 tons respectively at St. Vincent, the Cape, and Australia; freights being from 15s. to 120s., with the object of demonstrating that until freights were down to 15s. per ton, nothing could justify coaling entirely in England; supposing that the coal could be obtained at the other places at 30s., 50s., and 100s. per ton respectively; for simplicity, the quantities required to be taken at the different stations were taken at 500 tons.

The extent of the coal trade, particularly that of London, was then examined, and tables were given of the areas of the coal formations of the different countries of the world, and the annual production in 1852. The annual produce of England was stated to be estimated at 35,000,000 tons, and the quantity exported about 8 per cent. of the quantity raised. The areas of the coal fields in the United Kingdom gave a grand total of nearly 8,000 square miles.

The gradual increase, particularly in the trade by railway, was pointed out. Tables were also given of the kinds of coals imported into London, stating the ports whence they were shipped, as also the charges of the port of London on colliers.

GARLAND AND GLASSON'S PATENT SMOKELESS FURNACES.

(Patent dated July 25, 1854.)

Fig. 1.

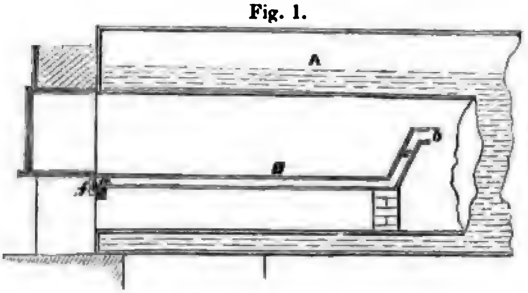
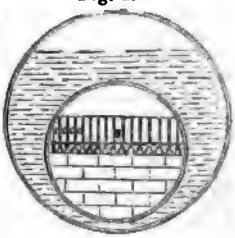


Fig. 2.



MESSRS. Garland and Glasson, of the Soho Foundry, patented at the above date an improvement in furnaces, which consists in the employment of hollow fire or grate

bars formed of cast-iron, wrought-iron, or other suitable materials, for the admission of air, having bends at their back ends which rise up and form the bridge. Fig. 1 of the annexed engraving is a sectional elevation; and fig. 2 a transverse section of a Cornish boiler, to which the invention is applied. A is the boiler, and B the grate formed of the hollow bars through which the air passes from *a* to *b*, and the ends, *c c*, of which form the bridge, as shewn. It is evident that the same arrangement of furnace may be easily applied to any other form of boilers.

The Origin and Progress of the Mechanical Inventions of James Watt. Illustrated by his Correspondence with his Friends, and the Specifications of his Patents. By JAMES PATRICK MUIRHEAD, Esq., M.A. 3 Vols. John Murray, Albemarle-street.

(*Concluded from page* 201.)

IT was not till the year 1784, nineteen years after the invention of the separate condenser, that Watt originated that most simple but ingenious contrivance, the "parallel motion," as appears from the following letter:

MR. WATT TO MR. BOULTON.

"*Birmingham, June* 30, 1784.

"I have started a new hare. I have got a glimpse of a method of causing a piston rod to move up and down perpendicularly, by only fixing it to a piece of iron upon the beam, without chains, or perpendicular guides, or untowardly frictions, arch-heads, or other pieces of clumsiness; by which contrivance, if it answers fully to expectation, about five feet in the height of the [engine-]house may be saved in 8-feet strokes, which I look upon as a capital saving; and it will answer for double engines as well as for single ones. I have only tried it in a slight model yet, so cannot build upon it, though I think it a very probable thing to succeed, and one of the most ingenious simple pieces of mechanism I have contrived; but I beg nothing may be said on it till I specify."

On the 11th of July, of the same year, he again writes to Mr. Boulton, thus: "I have made a very large model of the new substitute for racks and sectors, which seems to bid fair to answer. The rod goes up and down, quite in a perpendicular line, without racks, chains, or guides. It is a perpendicular motion derived from a combination of motions about centres, very simple, has very little friction, has nothing standing higher than the back of the beam, and requires the centre of the beam to be only half the stroke of the engine higher than the top of the piston-rod when at the lowest, and has no inclination to pull the piston-rod either one way or another except straight up and down. It has rather more power at beginning and end of the stroke than in the middle,—I think about one-sixth; which I believe will do no hurt in rotative motions, and little in any case. Beams mounted in this way need no arches; and the whole iron-work will not, I think, be more than chains, martingales, and their appendages, if quite so much. However, don't pride yourself on it; it is not fairly tried yet, and may have unknown faults. Where it is used, the beams will be best above the centre of motion, which will answer double engines very well, and may in most cases be dispensed with in the others."

His energies and faculties were, however, by no means exclusively devoted to the improvement of the steam engine. In Watt appeared the happy combination of great mental power with ceaseless and cheerful industry. Wherever a field for improvement in the arts or sciences was made visible by the bright light of his intellect, there he was sure to be found labouring, always with vigour, and rarely without success.

Upon this phase of his character his biographer, Mr. Muirhead, dwells with pleasing fervour. "In the retired course of life," he says, "which, from choice, as well as necessity, he appears to have followed (after his removal from his residence in the Glasgow College to an abode in the city), manual labour and mental study were blended in pretty equal proportions; but idleness or mere amusement had certainly no share. He ardently seized every opportunity of extending his acquaintance with the various branches of physical philosophy, and of investigating the principles of its phenomena, as if prophetically conscious that to his untaught but earnest apprehension might be revealed those secrets which hitherto had been hidden even from the wise and learned; endeavouring—to use an expression of his own—'to find out the weak side of Nature, and to vanquish her.' Beyond the necessity for some daily labour in order to earn his daily bread, and his hope—often, as will be seen, very uncertain—of future independence, he had little else than the pleasure he found in philosophical pursuits to stimulate or reward his zeal: the toils of his business were severe, and the profitable returns but small; while of those whose society was open to him, there were few indeed who possessed either an equality of learning or a community of tastes with

himself. But in his endeavours to subjugate, by the resources of practical art, those natural difficulties which presented themselves to his hand or eye, nothing seemed to deter his zeal or baffle his penetration; a very curious proof of which was afforded by his frequent construction, about the period at which we have now arrived, of musical instruments of perfect compass and tone, although he had himself, by nature, an absolute deficiency of all musical ear."

A remarkable instance of this is recorded in a document written by Watt's friend and brother philosopher, Professor Robinson:—"A mason-lodge in Glasgow," says the Professor, "wanted an organ. The office-bearers were acquaintances of Mr. Watt. We imagined that Mr. Watt could do anything; and, though we all knew that he did not know one musical note from another, he was asked if he could build this organ. He had repaired one, and it had amused him. He said 'Yes;' but he began by building a very small one for his intimate friend Dr. Black, which is now in my possession. In doing this, a thousand things occurred to him which no organ-builder ever dreamed of—nice indicators of the strength of the blast, regulators of it, &c., &c. He began to the great one. He then began to study the philosophical theory of music. Fortunately for me, no book was at hand but the most refined of all, and the only one that can be said to contain any theory at all—'Smith's Harmonics.' Before Mr. Watt had half finished this organ, he and I were completely masters of that most refined and beautiful theory of the beats of imperfect consonances. He found that by these beats it would be possible for him, totally ignorant of music, to tune this organ according to any system of temperament; and he did so, to the delight and astonishment of our best performers. In prosecution of this, he invented a real monochord of continued tone; and, in playing with this, he made an observation which, had it then been known, would have terminated a dispute between the first mathematicians in Europe—Euler and D'Alembert; which completely establishes the theory of Daniel Bernouilli, who differed from both of those gentlemen about the mechanism of the vibration of musical chords; and as completely explains the harmonic notes which accompany all full musical notes, overturning the theories of Rameau and Tartini."

We shall not attempt here even to enumerate the many inventions perfected by Watt, each of which bears the stamp of his sound judgment and extraordinary skill. Mr. Muirhead's volumes must be perused by those who would derive pleasure and improvement from a narrative of what Watt did, and, which is almost equally interesting, of what he said. In them the life of that great man is sketched by an able and laborious hand, and the work is completed by voluminous extracts from Watt's own correspondence, which, of themselves, form a most charming autobiography. We commend the work to our readers with entire confidence, feeling assured that, while they gather from it knowledge which is of the highest interest to students of practical science, they will not fail to meet with much that is calculated to shed a cheerful and hopeful light upon the path of all who, by genius and industry, seek, like Watt, to extend the great agencies of civilization.

We subjoin the following random passages from the "correspondence," as characteristic of the illustrious man whom we have been considering:

"MR. WATT TO DR. LIND.

"*Glasgow, April* 29, 1765.

"DEAR LIND,—* * * I have now almost a certainty of the *facturum* of the fire-engine, having determined the following particulars: the quantity of steam produced; the ultimatum of the *lever engine;* the quantity of steam destroyed by the cold of its cylinder; the quantity destroyed in mine: and if there is not some devil in the hedge, mine ought to raise water to 44 feet with the same quantity of steam that theirs does to 32 (supposing my cylinder as thick as theirs), which I think I can demonstrate. I can now make a cylinder of 2 feet diameter and 3 feet high, only a 40th of an inch thick, and strong enough to resist the atmosphere; *sed tace.* In short, I can think of nothing else but this machine."

"MR. WATT TO DR. ROEBUCK.

"*Glasgow*, 11 *Oct.*, 1765.

"I have made a trial of my machine. It has not entirely answered my expectations, though it has no fault but what I think I can cure. The principal one, and I believe the only one, was the untightness of the piston, which I think I have found a remedy for. However, I am certain its consumption of steam will be extremely small, and the condensation quick enough; and it may possibly be some days before I can come to you, as I must remedy everything before I send it away."

"MR. WATT TO DR. SMALL.

"*Glasgow*, 28 *April*, 1769.

* * *

"If linen-draper Moore does not use my engine to drive his chaises, he can't drive them by steam. If he does, I will stop them. I suppose by the rapidity of his progress and puffing, he is too volatile t

be dangerous. Let me know all you know of him.

"Nothing less than the experience I have had of steam and steam engines will enable anybody to erect one of my engines so as to be perfect, unless they should see one of mine and copy it exactly."

In the same letter we find him growing weary of his labours and disappointments. He says:—"I am resolved, unless those things I have brought to some perfection reward me for the time and money I have lost on them, if I can resist it, to invent no more. Indeed, I am not near so capable as I was once. I find that I am not the same person I was four years ago, when I invented the fire-engine, and foresaw, even before I made a model, almost every circumstance that has since occurred. I was at that time spurred on by the alluring hope of placing myself above want, without being obliged to have much dealing with mankind, to whom I have always been a dupe. The necessary experience in great was wanting; in acquiring it I have met with many disappointments. I must have sunk under the burthen of them if I had not been supported by the friendship of Dr. Roebuck. * * I have now brought the engine near a conclusion, yet I am not in idea nearer that rest I wish for than I was four years ago. However, I am resolved to do all I can to carry on this business, and if it does not thrive with me, I will lay aside the burthen I cannot carry."

Finally, like almost all great inventors, Watt, too, was victimized, and sometimes sickened, by adventurers. "Of all things in life," he says, "there is nothing more foolish than inventing. Here I work five or more years contriving an engine, and Mr. Moore hears of it, is more *éveillé*, gets three patents at once, publishes himself in the newspapers, hires two thousand men, sets them to work for the whole world in St. George's Fields, gets a fortune at once, and prosecutes me for using my own invention!"

Decimal Coinage Familiarly Explained in Theory and Practice; together with Tables Adapting it to Popular Use, and some Suggestions on Decimal Weights and Measures. By CORNELIUS WALFORD, Jun., London: Pitman, Paternoster-row, and Tuplin, Strand.

THIS little pamphlet, which is a reprint of a series of papers that appeared in the *British Controversialist*, contains a very admirable popular account of the present condition of the decimal question. The author, by restricting himself mainly to an unbiassed statement of the apparent advantages and disadvantages of the various systems proposed, has afforded to the reader the best possible means of forming an intelligent estimate of their respective merits. The pamphlet, by being widely circulated, will assist greatly in forming that public opinion, the want of which was, in the judgment of the late Chancellor of the Exchequer, the only hindrance to the adoption of a decimal system.

ON THE INDICATED HORSE-POWER OF STEAM ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—In the number of the *Mechanics' Magazine* of the 17th of last month, "Ingénieur" calls your attention and that of your readers to what he conceives to be a very singular error that exists in the present method of calculating the power of engines, from diagrams obtained by the indicator. I find no notice taken of his communication in your last number, and as I consider his notions to be erroneous, I beg to trouble you with what I conceive to be a more correct method of handling the subject.

The problem, as I understand it, is this: Given an indicator diagram to find the work done by the piston of the engine from which it was obtained in one stroke.

There is, I think, no necessity to introduce the notion of time, and consequently of velocity, into the question; it will be more convenient to proceed in the usual way, which I believe to be as follows: The atmospheric line of the diagram represents at a certain scale the stroke of the piston, in feet and fractions of feet. The ordinate erected at any point of this line will represent at a certain scale the pressure in lbs. on each unit of surface of the piston at this point of its stroke, and if a second ordinate be erected at a point separated from the former by an infinitely small distance, the arithmetical mean between the two ordinates will represent the pressure on the piston during the infinitely small fraction of its stroke, represented by the distance between the two ordinates; if, then, this distance be multiplied by the mean of the two ordinates, the product will give the work done by each unit of the piston's surface during the element of its stroke, represented by the distance between the ordinates. But this product represents also the area of the infinitely small portion of the diagram comprised between the ordinates; consequently, in order to obtain the quantity of work done by each unit of the piston's surface during its whole stroke, it is necessary only to find the area of the diagram, which can be readily done by Simpson's formula. The result

will enable us to calculate the work done by the steam during each stroke of the piston. But the effective power transmitted to the crank-shaft can, I think, be ascertained by no other means than by the application of the brake.

I will add, in conclusion, that I think that the indicator was intended by its illustrious author (James Watt) to indicate the state of efficiency of the engine, rather than its power, inasmuch that if the engine be known to be in good working order and well proportioned, the diagram could be constructed without the aid of the instrument. But if the effective power of the engine is to be calculated from the diagram, it can only be done by the aid of a coefficient, the value of which cannot be easily determined.

I am, Sir, yours, &c.,
MÉCANICIEN.

Paris, March 1, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—As no one has condescended to notice the letter of "Ingénieur," who attempts, in your number of the 17th of last month, to prove that the present method of calculating the horse power of the steam engine by diagrams taken by a M'Naught indicator is singularly erroneous, will you allow me to make a few remarks in reply?

It is plain to me that the average of the pressure of the steam in pounds upon each square inch of the piston, during each stroke of the piston, multiplied by the area of the piston in square inches, and this last product multiplied again by the space in feet the piston passes through per minute, will give the units of work performed upon the piston per minute. If this last product be divided by 33,000, or the units of work performed by one horse, the quotient will be the number of horses power of the engine, allowing nothing for friction. By referring to diagram No. 1, at page 157, it will be found that the perimeter of that diagram, as well as that of all others, is formed by the pencil of the indicator whilst the piston of the engine is making one down and one up stroke. The slightest reflection will convince any one that it is a matter *of perfect indifference what is the velocity of the piston during any portion of either the down or up stroke of the piston*, since all that is wanted to be known, in order to tell exactly the pressure upon each inch of the piston, is the area of the figure, bounded by the perimeter made by the pencil of the indicator, whilst the piston of the engine is making one down and one up stroke.

It is quite clear, if we only knew the area of this figure, in order to get the average pressure of steam upon each inch of the piston of the engine, we should have only to divide the area of the figure by the length of the atmospheric line which is made by the indicator. The method which is adopted to find the pressure upon the piston of the engine by the indicator is to put a ruler at right angles across the atmospheric line, and then rule off a number of lines (usually ten in number) across the area of the diagram, as is shown by the dotted lines across fig. 1, page 157. The aggregate of these lines is then divided by the number of the lines, and the quotient is taken to represent the average pressure of the steam upon each inch of the piston. Now, Sir, it is admitted by all parties acquainted with the subject, that this method is at best only an approximate method of coming at the average pressure of steam upon each end of the piston, and in some cases gives results wide of the truth. What is wanted to make the indicator a perfect measure of pressure of steam upon the piston is some contrivance, by means of which the area of the diagram, of whatever form, may be found exactly and easily. I cannot see that the method pointed out by "Ingénieur" at all meets the case, and I think by this time he will see that he is in error when he points out the varying motion of the piston from bottom to top or from top to bottom as any source of error in calculating the horse power of steam engines by diagrams taken by a M'Naught indicator.

I remain, Sir, yours, &c.,

Burnley, March 6, 1855. JAMES EMMETT.

DEFECTIVE ILLUSTRATION OF SCIENTIFIC WORKS.

To the Editor of the Mechanics' Magazine.

SIR,—It is just fifteen years since I published, in your thirty-second volume (page 680), a letter condemnatory of the faulty illustrations then appearing in various popular scientific works; and I am not a little chagrined to find the complaints then urged so often applicable to similar works at the present time.

I have now before me the fifth volume of *The Museum of Science and Art*, edited by Dionysius Lardner, D.C.L.; a work which, from its high pretensions, as well as the world-wide celebrity of its author, would have led us to expect better things. No. 60 of this work is devoted to a familiar explanation of "Common things," with the most *uncommon* illustrations. The subject matter of this number is pumps, and it is much to be regretted, that the learned Doctor attempted to dispose of so important and

interesting a subject in a small tract of sixteen pages, by no means closely printed.

The frontispiece—or, as a sailor would call it, the figure-head—of this tract is said to represent "a forcing-pump," and is, it appears, doing duty for "a garden engine, fig. 19," absent without leave! The same cut appears in page 189 as fig. 16 of the illustrations, and is described as "constructed for demonstration at popular lectures!" Passing by the serious disproportion of the small air-vessel to the larger pump-barrel, I would observe, that there is no communication whatever shown between them; and that the pump-handle is immovably attached to the piston by a rod which passes through the solid cover of the pump-barrel, and therefore can only move in *straight lines*, while the extremity of the pump-handle can only describe a *curve*.

Fig. 13 is said to represent "the *working* model of a suction-pump, usually provided for demonstrations in popular lectures," but is just as *unworkable* as the other, and for two reasons. In this instance, the piston-rod is carried down a long narrow tube, mounted, without any rhyme or reason, on the top of the pump-barrel, entailing the antagonism between motion in *straight* and *curved* lines as before. The piston appears nearly at the top of its stroke, but the end of the pump-handle is so nearly in contact with the elevated glass reservoir, that there is no room for motion.

Demonstrations with such "working models" would indeed be Q(ueer) E(nough) D(one); the only thing that could possibly be *demonstrated* would be the stupidity of their designer!

Fig. 20 is said to be a section of a fire-engine in its "most usual form;" it should have been most *unusual*. Neither entrance nor exit passages are shown, and a learner would be exceedingly puzzled to discover how the water gets in or out, or how the apparatus itself is put together.

That such objectionable illustrations as the foregoing should be admitted into popular scientific works in 1855, when the same subject was illustrated by better figures nearly two centuries ago, is truly surprising, and by no means creditable to authors, artists, or publishers. It cannot possibly be objected that the low price of the work precluded the use of better illustrations, because correct outline drawings—the very best for the purpose—would have cost less than the full-shaded, fanciful figures which now disfigure the pages in question.

Variety is charming, and originality desirable; but surely originality does not necessarily imply absurdity, nor need variety entail disgust.

The appearance of these monstrosities is the more to be regretted, because most of the illustrations in *The Museum of Science and Art*—take the article on steam-engines in the same volume for instance—are exceedingly good.

Commending my former letter of April, 1840,* to the careful consideration of all authors, illustrators, and publishers of popular treatises,

I am, Sir, yours, &c.,

WM. BADDELEY.

13, Angell-terrace, Islington,
March 7, 1855.

MR. WILLIAMS ON COMBUSTION.

To the Editor of the Mechanics' Magazine.

SIR,—In reply to Mr. Williams, I beg to state that I had no copy of the memorandum in question. I only recollect its contents referred generally to the error I indicated, and closed with an expression of satisfaction at finding that the practice of so eminent an engineer as Mr. Craddock was entirely in support of Mr. Williams's own views. But though this paper be lost, there will be little difficulty in supplying its place. I wrote fully on the oversight to Mr. Dircks; and lent him, by request, my copy of the lectures (published by the bye, not lately, as named in Mr. Williams's treatise but nine years since), to complete the investigation. Besides this, your invaluable journal for 1847, contains in July, August, and September, copious particulars illustrated with excellent engravings, by the aid of which no one will be at a loss to ascertain that I allege correctly that it is a considerable mistake to confound tubes containing water and surrounded by a space of flame eminently calculated to promote every requisite for perfect combustion, with tubes containing flame, surrounded by water, and tending to foster all those elements of imperfect combustion which Mr. Williams deprecates. Hearing of Mr. Williams's indisposition and regretting it, I should have left the promised correction to his leisure, but when the most proper disavowal of the "league" appeared, I felt I could not conscientiously remain silent, when I knew, what Mr. Williams evidently never thought of, that I was the same person who had been engaged in this indirect communication. The loss has been Mr. Williams's in mistaking one whom he fully characterizes as the most comprehensive writer on the subject of boilers. The lectures in question, and the works they describe are avowedly based upon the principles set forth in Mr. Williams's first treatise, and had the master understood the

* *Mech. Mag.*, vol. xxxii. p. 680.

disciple as completely as the disciple understood the master, the forty or fifty steam ships of the City of Dublin Navigation Company, might have been now working at an economy of two-thirds their present consumption of coal, with total immunity from danger by explosion. Whilst this was doing other companies would not likely have been slow in pursuing such a race of economy and commerce, and the result might have been a penetration of the rhinoceros hide of the Admiralty. The amazing and imperturbable stolidity of official routine might have been moved to intelligence, and the same advantages being admitted to the 200 war steamers now afloat, some compensation in this service might have been derived for the horrible and "heart-rending" waste and destruction of other departments.

I cannot better illustrate the amount of the error than by the following comparison: Suppose some eminent writer, Priestley, for instance, at the end of the last century, should in some treatise have commented on the new steam engine which Watt was bringing forward. If he had censured Watt for omitting in his statements the *loss of heat arising from condensation in the cylinder*, this would have been a great mistake, for the very essence of the invention was to save this loss by condensation in a *separate vessel*. So, also, Craddock's boiler was especially devised to annihilate all those conditions of loss, which are carried to extreme in the fine tubes condemned by Mr. Williams. It is therefore a mistake to charge him with overlooking defects which it had been his successful effort to remove.

It is but three years since I became acquainted with these great improvements in steam power. In that interval I have done what I could, from public motives, to make them known. The matter I have published on them in various works, would make a bulky octavo if collected; and as some papers, those, for instance, of comparison with the Ericsson bubble, have been exclusively reprinted, I hope I have done some good. But it is, at least, very little compared to what I wished to effect, had not my time and means been absorbed in a tedious chancery suit with a host of combined barbarians, laical, clerical, and quakerial, whose doings would startle even the most ardent devotee of romantic fictions. I shall therefore be well pleased to have the aid of those actually interested in steam power, to promote the truth and carry this great agent a stage as far beyond the maturity of Watt, as he carried it beyond the rudiments of Newcomen.

I am, &c.,

DAVID MUSHET.

March 5, 1855.

PARKER'S PATENT SMOKE-CONSUMING APPARATUS.

To the Editor of the Mechanics' Magazine.

SIR,—Considering that the special pleading of Mr. Williams, at page 181, was no answer to my last letter, and that such of your readers as took any interest in the question at issue had materials enough before them whereupon to form an opinion, I had determined not to trespass farther on your valuable space. The contents of your last number, however, have induced me to resume my pen, with a view of showing that I am neither so forgetful a reader, nor so careless a writer, as Mr. Williams seems to intimate. Regard for your limited space had certainly led me to write with more brevity than was perhaps judicious, in dealing with so skilful a controversialist as Mr. Williams: but no matter.

Mr. Williams having ingeniously diverted the present discussion from the original topic, permit me to remind your readers that it originated in Mr. Williams having upon two occasions (unjustly, as I conceived) designated the smoke-consuming apparatus patented by Mr. Parker,* "a re-invention." To this I objected, contending that both Mr. Williams's and Mr. Parker's contrivances were each distinct and legitimate applications to furnaces, of the well-known principle originally introduced by M. Argand in the lamp which bears his name. This reference to M. Argand, at one time much dwelt upon by Mr. Williams himself, is, it seems, *now* distasteful to him, and he says that "he did not give the name of *Argand*" to his furnace, or to his mode of introducing air thereto. To show that the mistake, if it be one, did not originate with me, I quoted extracts from Mr. Williams's own book, in which it is most distinctly asserted that *he did* give the name of *Argand* to his mode of introducing air, &c.

Mr. Williams further stated that "the name of *Argand* did not appear in his Patent Specification." Whereupon I referred to Mr. Williams's own communication in your 37th Volume, in which he told us that the name of *Argand did* appear in that document. Still further, Mr. Williams says, the name of *Argand* was not given to his patent furnace until "many years after the date of his patent." Whereas, a reference to the *Mechanics' Magazine*, and many other publications, shows that Mr. Williams's invention was universally known as the *Argand* furnace, almost as soon as made public.

In the first part of Mr. Williams's treatise

* Described in Vol. lxi., p. 444.

on Combustion, he speaks indifferently of the "Argand lamp, the Argand principle, and the Argand furnace." He now endeavours (page 182) to draw a very nice and subtle distinction between the "Argand *lamp*" and the "Argand *gas-burner*," a distinction nowhere adverted to in Mr. Williams's book or former writings, nor is it even at this time a matter of any importance. Nevertheless, this distinction is carefully imitated by Mr. Williams's echo, Mr. Dircks, in the letter introduced by Mr. Williams at page 206. In this letter, too, Mr. Dircks states that *he* gave the name of "*Argand*" to Mr. Williams's furnace in 1840-1 (not "many years after the date of the patent," by the bye!). But if Mr. Williams is right in saying it was so described in the specification, then the christening must have taken place previous to December, 1839.

Singularly enough, and most àpropos, your last Number contains, among the list of "provisional specifications not proceeded with," one by this same Mr. Dircks, for perforated air-distributors in the form of boxes, bricks, &c., placed in any convenient part of furnaces. The reason for this patent not being proceeded with may probably be attributable to this would-be patentee having been forestalled by Mr. Parker, whose perforated air-distributors, in the form of boxes, or bricks, &c., had been previously patented.

The fact of Mr. Dircks — the enterprising and energetic agent of Mr. Williams, and who boasts that "he has superintended the erection of above 2,000 *Argand furnaces*,"*—having applied for such a patent, is the strongest possible proof that Mr. Dircks, like myself and others, is decidedly of opinion, that his late employer, Mr. Williams, has not so thoroughly monopolised or exhausted the principle of perforated air-distributors as applicable to furnaces, but that novel and useful modifications thereof may yet be devised (Mr. Parker's to wit) that will not constitute mere "re-inventions" of Mr. Williams's expired patent.

I am, Sir, yours, &c.,

WM. BADDELEY.

13, Argyll-terrace, Islington,
March 5, 1855.

* Williams on "Combustion," p. 244.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

TAYLOR, THOMAS GEORGE, of King's Arms-yard, London, steam share broker. *The use or application of the stalk of the hop plant in the manufacture of paper, pasteboard, and millboard, cordage, rope, and textile fabrics.* Patent dated August 12, 1854. (No. 1761.)

This invention mainly consists in submitting the plant to process immediately after the stalk is cut and the hops gathered.

WOODCOCK, WILLIAM, of the Earl's-court Brewery, Brompton, Middlesex. *An improvement in the combustion of fuel.* Patent dated August 12, 1854. (No. 1762.)

A full description of this invention was given in Nos. 1627 and 1629.

WESTON, GEORGE, of Sheffield, York, cabinet maker. *An improved veneering apparatus.* Patent dated August 12, 1854. (No. 1764.)

This invention consists—1. In transmitting heat through a sheet of metal to the glue after the veneer has been placed upon the foundation to which it is to be connected. 2. In the employment of metal screw clamps in the place of clamps made of wood in veneering operations.

PETRIE, JOHN, jun., of Rochdale, Lancaster, ironmonger. *Improvements in machinery or apparatus for drying wool.* Patent dated August 12, 1854. (No. 1766.)

These improvements consist in drying wool, after the washing or other process has left it damp, by causing currents of air to pass in contact with it, by means of a fan or other equivalent mechanism. Also, in the employment of perforated or porous flaps, upon which the wool is placed, and which form the enclosures of a chamber through which air is forced or drawn.

HENNEBUTTE, HENRI LOUIS EDMOND DÉSIRÉ, of Esquermes lez Lille Nord, France. *Improvements in the manufacture of varnishes.* Patent dated August 14, 1854. (No. 1768.)

Claim.—The distillation of raw gum copal, of any description, for the purpose of rendering it entirely soluble, by expelling from it the insoluble portion.

MOORE, JOSEPH, of Manchester, Lancaster, silk manufacturer, SAMUEL BESWICK, of Failsworth, same county, warehouseman, and BENJAMIN WILSON, of Woodhouses, same county, weaver. *Certain improvements in the manufacture of piled goods or fabrics.* Patent dated August 14, 1854. (No. 1769.)

Claims.—1. The use of a lath or bar, by the aid of which one warp-beam may be dispensed with in the weaving of double grounds or cloths. 2. The use of a straight blade, with one cutting edge, mounted or encased in a gauge or guide, so that whilst the sheath gauge or guide stretches the two cloths asunder, the pile being thus kept tightly distended, the sharp edge of the cutting-blade is held firmly in the middle of the pile, and cuts it by means of the to-and-fro motion.

TODD, WILLIAM, of Haywood, Lancaster, manufacturer, and JACOB TODD, of the same place, overlooker. *Certain improvements in power looms for weaving.* Patent dated August 14, 1854. (No. 1771.)

The inventors claim a picking motion, effected by a double motion attached to cross pins or studs and operating upon the picking-rod; and the application and use of a quadrant and pinion or segmental plate, and of straps working vertically and reciprocally, driven by appropriate gearing from the crank-shaft, and imparting motion to the healds as well as to the opposing cross pin of the picking motion, &c.

CROSLAND, WILLIAM, of Hulme, Lancaster, engineer. *Certain improvements in machinery or apparatus for governing or regulating the speed of steam engines, or other motive-power engines.* Patent dated August 14, 1854. (No. 1772.)

These improvements consist in placing on a shaft, connected with and driven by the engine, a screw, fitting loosely, but so as to partake of the revolution of the shaft, and in attaching to the end of the screw a lever connected with the regulating-valve of the motive power, this screw having a tendency to close the valve by sliding along the shaft. The fulcrum upon which the screw is made to act is removed by a vibrating pendulum or balance-wheel, the screw being allowed to move in an opposite direction, to the extent of one thread, by means of a weight.

SMITH, HENRY, of Smethwick. *Improvements in the manufacture of wrought-iron wheels.* Patent dated August 14, 1854. (No. 1773.)

Claim.—"The manufacture of the central portion of a wrought-iron wheel out of a mass, by extrusion of the plastic iron from a cylinder or receiver into a mould combined therewith."

BEARDMORE, JOSEPH, jun., of Stowage, Deptford, Kent. *Improvements in supplying air to furnaces.* Patent dated August 14, 1854. (No. 1774.)

This invention consists in employing hollow fire bars in combination with hollow iron bridges.

GREAVES, JOHN, of Birmingham, Warwick, manufacturer, and CHARLES MICHAEL GREAVES, of Birmingham, manufacturer. *An improvement or improvements in the manufacture of certain kinds of spectacle frames.* Patent dated August 15, 1854. (No. 1775.)

This invention consists—1. In cutting spectacle frames out of sheet-metal. And 2. In forming the joints of spectacle frames, by attaching suitably-formed pieces of metal to the sides of the frames.

STRATFORD, BENJAMIN O'NEALE, Earl of Aldborough, of Stratford-lodge, Wicklow, Ireland. *Improvements in projectiles.* Patent dated August 15, 1854. (No 1776.)

Claim.—The construction of projectiles the greatest transverse diameter or section of which is at the extreme foremost part, or whose foremost part is at least as broad as any other portion of the projectile, including in this measurement the breadth of an air-channel with a trumpet-mouth, which passes through the projectile in a longitudinal direction; this invention being applicable to projectiles of all descriptions, whether for small arms or ordnance.

NORTON, JOHN, of Cork, esquire. *Improvements in bolts and projectiles for fire-arms.* Patent dated August 15, 1854. (No. 1777.)

A full description of this invention will shortly be given.

CAUNCE, ROBERT, of Bolton-le-Moors, Lancaster, cashier. *Certain improvements in machinery for preparing cotton and other fibrous materials.* Patent dated August 16, 1854. (No. 1779.)

This invention consists in the application to roving frames and other like machines used in preparing fibrous materials of certain improved machinery, whereby any single spindle and bobbin may be stopped and again started, without stopping the entire machine.

FRANKHAM, SAMUEL, of Greenland-place, Middlesex, engineer. *Improved means of consuming smoke and economizing fuel in furnaces.* Patent dated August 16, 1854. (No. 1785.)

This invention consists in so constructing the walls of the furnace, "that the smoke and combustible matters from the fuel may be made to pass through a series of openings of moderate size and be brought into contact with the flame from the fire."

KENNARD, WILLIAM, of Little Queen-street, Holborn. *Improvements in attaching door or other knobs or handles.* Patent dated August 16, 1854. (No. 1787.)

This invention consists in so forming the knobs or handles that they turn in the rose, which is fixed by means of a screw and nut. For this purpose the shanks of the knobs or handles are made with projections which fit into and revolve in grooves formed in the roses.

BURGESS, WILLIAM, of the firm of Burgess and Key, of Newgate-street, London, agricultural engineers. *An improvement in or addition to reaping and mowing-machines.* Patent dated August 16, 1854. (No. 1788.)

Claim.—Constructing reaping and mowing-machines with one or more Archimedean screws fitted thereto, for the purpose of delivering the cut crops off such machines.

SIDDONS, WILLIAM, of Birmingham, Warwick, gun-lock maker. *Improvements in locks for guns and other fire-arms.* Patent dated August 16, 1854. (No. 1789.)

Claims.—1. Constructing percussion-lock plates with a second and outside support or bearing for the axis of the tumbler. 2. Forming the tumbler in gun-locks with a lengthened arm, and employing in combination therewith a lengthened swivel or link, formed with knife edges, for the purpose of obtaining rapidity of action and quickness of fire.

LAMB, JOHN, and THOMAS LAMB, both of Kidderminster, Worcester, machinists. *Improvements in Jacquard machinery, and in the apparatus connected therewith.* Patent dated August 16, 1854. (No. 1790.)

Claims.—1. The use of a shield or guard for the purpose of protecting the ends of the needles. 2. The use of a perforated sliding plate, open frame, or grating, as a substitute for the ordinary cylinder. 3. The use of certain guide-studs or pins for the purpose of guiding or directing the cards in front of the needle actuator. 4. A peculiar construction, arrangement, and mode of working these guide-studs or pins. 5. A mode of adjusting these guide-studs or pins laterally, to suit any variety in the length of the cards. 6. The use of metal eyelets fitted into the nipple or peg-holes of the cards, for the purpose of preventing undue wear at those parts. 7. A peculiar arrangement of needles, whereby nine needles in depth are made to operate upon three reeds in a five or six-frame Brussels loom. 8. A method of stopping the loom, or sounding an alarum when any card is improperly presented to the needles, &c.

WALLWORTH, THOMAS, of Manchester, Lancaster, British gum-manufacturer. *Improvements in purifying and treating grain, and in dressing flour, and in machinery for these purposes.* Patent dated August 16, 1854. (No. 1792.)

The grain to be operated upon is taken in a dry state, and while passing through an inclined cylinder of wire-work or perforated plate is acted upon by straight blades, which are fixed at an angle to a radial line, on an axis which is made to revolve rapidly, &c.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in furnaces, and in the consumption or prevention of smoke.* (A communication.) Patent dated August 16, 1854. (No. 1793.)

Claims.—1. A mode of consuming or preventing smoke, by causing the gases from furnaces to be conveyed a second time or oftener through the furnace by means of exhausting and blowing apparatus. 2. A mode of conducting the gases from furnaces along with fresh atmospheric air beneath the fire-bars, so as to pass again through the furnace.

COWPER, CHARLES, of Southampton-buildings, Chancery-lane, Middlesex. *Certain improvements in the felting of hats, and in machinery for that purpose.* (A communication.) Patent dated August 17, 1854. (No. 1795.)

Claims.—1. Constructing machinery for the felting of hats, having an upper and lower series of rollers (or rollers and revolving brushes) mounted in two separate frames, which receive an alternate reciprocating transverse motion, and so arranged that the rollers in the upper series may be over the spaces between those in the lower series. Also, certain arrangements for varying the extent of the motions in the aforesaid machinery. 2. Felting hats by means of the machinery described; and, also, heating both sides of the hat bodies by hot water and steam during the process of felting by machinery. 3. A mode of felting hats of unequal thickness in different parts, by operating on the hat bodies in a folded state by the described or similar machinery.

WRIGHT, JOHN TURNER, of Birmingham, Warwick, manufacturer, and EDWIN PAYTON WRIGHT, of Birmingham, manufacturer. *An improvement or improvements in the manufacture of ropes, cords, lines, and twines.* Patent dated August 17, 1854. (No. 1796.)

The inventor describes a machine in which the processes of scraping, sizing, scouring, stripping or polishing, and drying, are simultaneously performed upon ropes, cords, &c., as they pass slowly through it.

HACKETT, JOHN, of Derby, manufacturer. *The manufacture of new and improved fabrics of cotton and of linen, and of cotton and linen combined.* Patent dated August 17, 1854. (No. 1797.)

This invention consists in the employment of doubled or twisted linen or cotton, or linen and cotton combined, of two or more threads to the cord, in the manufacture of cloth of not less than ten inches wide.

BLAKE, CHARLES, of St. Leonard's, Sussex, painter. *An improvement in or addition to doors, and door and window-frames.* Patent dated August 17, 1854. (No. 1798.)

This invention consists in putting spring slides to doors and windows and to their frames for the purpose of excluding draught, dust, &c., and of preventing rattling.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture of boots and*

shoes, or other coverings for the feet. Patent dated August 17, 1854. (No. 1800.)

This invention consists in uniting the outer soles and heels of boots and shoes to the upper and other parts, when an adhesive substance or material is employed, in a vacuum.

KOEFFLER, LOUIS CHRISTIAN, of Rochdale, Lancaster, bleacher and dyer. *Improvements in extracting colouring matter, also applicable for extracting size or glue from animal substances.* Patent dated August 17, 1854. (No. 1801).

This invention consists in the use of two or more vessels connected together in such a manner that the extract can be transferred from the one to the other at pleasure, by steam or other pressure, and can be discharged into cisterns placed in any convenient situation.

SPALDIN, SARA, of Hull, Yorkshire, spinster. *Improvements in apparatus for preventing loss of life at sea.* Patent dated August 18, 1854. (No. 1802.)

The inventor constructs life-buoys of any suitable light material, and provides the sides and fronts of them with receptacles for storing provisions, spirits, clothing, papers, signal rockets, in air and water-tight boxes, canisters, &c., and around the exterior edge of each life-buoy attaches a looped rope, to which persons may cling if necessary.

TRENERY, EDWARD, of Stourbridge, Worcester, conductor. *A new or improved machine for driving piles.* Patent dated August 18, 1854. (No. 1803.)

The hammer or ram of the improved machine is raised and detached from the raising mechanism by means of a rack attached to a chain which is connected to a pulley hanging in a second chain the end of which is coiled on a drum working on the frame of the machine.

WALTON, JOSEPH FOWELL, of Sarratt-hall, Hertford. *Improvements in obtaining impressions from lithographic stones or plates.* Patent dated August 18, 1854. (No. 1805.)

These improvements consist in a mode of obtaining impressions, either in colours or in black and white, from stones or plates, by so preparing and treating the latter, after the drawing has been made upon them, that the design shall be "etched," on by means of nitric or muriatic acid.

CLARKE, JOHN PRETTY, of Leicester, cotton-winder. *Improvements in the manufacture of reels for reeling of cotton, linen, thread silk, or other fibrous material.* Patent dated August 18, 1854. (No. 1807.)

This invention consists in manufacturing reels, or ends of reels, of wood, bone, hoof, horn, ivory, pearl, papier maché, pasteboard, gutta percha, leather, china, and glass, in such manner that the contents of the reels may be seen through one or both ends.

RAMMELL, THOMAS WEBSTER, of Trafalgar-square, Middlesex. *Improvements in stoves and fire-places.* Patent dated August 18, 1854. (No. 1808.)

This invention consists in "constructing fire-places or stoves of fire-clay, or moulded forms of fire-clay, with a downward draft, and in such manner that the upper part of such stove or fire-place may be open, and the fire on all sides closed."

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improved machinery for cutting files and rasps.* (A communication.) Patent dated August 18, 1854. (No. 1809.)

This invention consists in constructing, combining, and operating a certain hammer, cutter, racks, pinions, cams, or eccentrics, &c., &c., in connection with a vibrating hammer, for the purpose of effecting the graduation of the blow at the commencement of the operation.

CONEY, JOHN, of Birmingham, Warwick, corkscrew and steel-toy manufacturer. *An improved construction of corkscrew.* Patent dated August 18, 1854. (No. 1811.)

Claim.—A mode of connecting a certain screw-stem and helix screw together, and of imparting the requisite rotary and vertical motion to the latter, for the purpose of piercing the cork, and of afterwards drawing it out.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in preserving corn and other dry seed.* (A communication.) Patent dated August 18, 1854. (No. 1812.)

Claims.—1. The employment of certain air-tight and water-tight store-rooms. 2. Certain mechanical arrangements for inspecting the grain and seeds when enclosed in these store-rooms. 3. A mode of regulating the desiccation of grain and seeds containing too great an amount of humidity before storing the same, by means of a thermometer.

KER, WILLIAM, and MATTHEW KER, both of Tottenham-court-road, Middlesex, cabinet-makers. *An improvement in the frames of expanding tables.* Patent dated August 18, 1854. (No. 1814.)

Claim.—Forming one set of the frames with a T, or other suitably-shaped tongue-piece, and fitting the corresponding frames with friction rollers or clips placed at intervals, and between which the tongues are free to slide.

CALVERT, FREDERICK CRACE, of Manchester, Lancaster, professor of chemistry. *Improvements in the treatment of heating, puddling, and refinery iron slags or cinders.*

Patent dated August 18, 1854. (No. 1815.)

Claim.—The use of hydrate of lime, or slacked lime, in combination or intimately mixed, with heating, puddling, and refinery iron slags or cinders, both before and after calcining.

KERSHAW, SAMUEL, of Heywood, Lancaster, manufacturer, and JAMES TAYLOR, of the same place, manager. *Certain improvements in carding engines.* Patent dated August 18, 1854. (No. 1816.)

These improvements consist "in the application of a comb or toothed or serrated edge or plate to the extremity or edge of 'Bodmer's feeding plate,' in combination with 'the patent India-rubber cards,' applied for the purpose of wrapping or clothing the 'feed roller.'"

LUND, EDWARD, of Manchester, Lancaster, gentleman. *Improvements in cocks, valves, water-plugs, and flexible joints.* Patent dated August 18, 1854. (No. 1817.)

A full description of this invention will be given hereafter.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in moulding or shaping articles of vulcanized caoutchouc.* (A communication.) Patent dated August 18, 1854. (No. 1819.)

Claim.—"A mode of forming or moulding sheets, scrapings, filings, dust, or powder of hard vulcanized India-rubber into a compact and solid mass of any desired form, by means of a high degree of heat and pressure, in moulds or matrices."

BARROWS, JOSEPH, of Handsworth, Stafford, wine-merchant. *A new or improved instrument to be used in cutting loaves of bread and other articles of food.* Patent dated August 19, 1854. (No. 1824.)

The inventor describes a tray, having clamping mechanism for holding the article of food while it is cut, and a guard for preventing accidents when the same is in use.

BROUGH, NEHEMIAH, of Birmingham, Warwick, machinist. *A new or improved dress-fastening.* Patent dated August 19, 1854. (No. 1825.)

Claim.—A dress-fastening, in which two parts which compose it are made to engage with and disengage from each other, in a peculiar manner, as described.

HODGSON, JAMES, of Sweeting-street, Liverpool. *Improvements in the construction of iron vessels.* Patent dated August 19, 1854. (No. 1826.)

The inventor constructs iron vessels with openings at the bottom, capable of being closed by water-tight valves or covers, for the purpose of facilitating the discharge of their cargoes.

ALLEN, JAMES, of North-street, Aberdeen, practical engineer, and JAMES TAYLOR, of the same place, joiner. *Improvements in the construction of rotatory engines.* Patent dated August 19, 1854. (No. 1827.)

In this improved rotatory engine, of which we shall probably give a full description hereafter, the steam passes through a steam-way in an axis, and acting against a fixed partition, and against parts connected with the axis, communicates motion to the latter, and then passes out into a containing case, &c.

GREENWOOD, WILLIAM VITRUVIUS, and JOHN SAXBY, of Brighton, engineers. *Improvements in signal-lamps.* Patent dated August 19, 1854. (No. 1830.)

The outer casing of the improved lamp is furnished with two ordinary lenses or bulls' eyes of uncoloured glass, and within it is fitted a cylindrical metal frame, which extends above the lenses, and in which are fastened two pieces of coloured glass, one red and the other green, in such manner that either of these glasses may be interposed at will between the flame of the lamp and one of the lenses, and a light of different colours be thus exhibited.

WORRALL, JAMES, jun., of Salford, Lancaster, dyer and finisher. *Improvements in the method of cutting fustians, cotton velvets, and other piled goods or fabrics.* Patent dated August 19, 1854. (No. 1831.)

This invention consists in causing the cloth to advance to the cutter, by means of machinery, so that the operative is enabled to cut each single race the entire length of the piece without removing his knife, and to perform this operation throughout the entire width of the piece consecutively upon each race. Suitable machinery is described by the inventor.

BRISCO, ROBERT, of Low Mill House, Saint Bees, Cumberland, esq., and PETER SWIRES HORSMAN, of St. John's Beckermet, in the same county, gentleman. *Improved machinery for preparing flax, hemp, and other fibrous substances for spinning.* Patent dated August 21, 1854. (No. 1832.)

Claims—1. The application to spreading machines of a self-acting feeder, for depositing the stricks of flax on the travelling gills.—2. The application of a presser for pressing down the stricks of flax on to the teeth of the gills.

MILLER, THOMAS, of Fairfield-place, Stepney, Middlesex. *Improvements in apparatus for raising coals and other weights from the holds of ships and other places.* Patent dated August 21, 1854. (No. 1834.)

At the ends of a lever or yard, fitted so as to be capable of motion in the direction of its length, upon an upright spar or mast, are attached ropes or chains, which are passed first over gins or pulleys, fixed to

the lower ends of the upright spar, then over other pulleys at the ends of the lever or yard, and are then led the one to the weight to be raised and the other to the barrel of a windlass.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

Cox, Thomas, of Southampton-street, Strand, Middlesex, church warehouseman. *Improvements in stools, cushions, and hassocks.* Application dated August 12, 1854. (No. 1759.)

This invention consists in providing stools, &c., with movable covers made to protect their upper surfaces from dirt when not in use, and in forming them with recesses for the feet, lined with fur.

Roguier, Pierre Athanase, of Paris, France. *A new mode of treating and curing varicose veins of the human body.* (A communication.) Application dated August 12, 1854. (No. 1763.)

This invention consists in the application to varicose veins "of a mixture composed of liquid per-chloride of iron and a maceration of the white clematis plant, made by steeping the said plant in the said liquid per-chloride of iron, and also in a new ointment, composed of hogs'-lard, per-chloride of iron in a solid state, sal ammoniac, and deut-oxide of iron."

Stoneham, James Tolputt, of Manchester, Lancaster, manager. *Improvements in the mode or method of rendering woven fabrics waterproof, and in the substance or composition used for the purpose.* Application dated August 14, 1854. (No. 1767.)

The inventor proposes to make a composition of tar, oil, resin, beeswax, and caoutchouc, or solvents of caoutchouc, and mix the same with any felted fibrous matter, and to force the mixture into the material to be waterproofed by pressure.

Haworth, Peter, of Manchester, Lancaster, currier and leather dealer. *An improved belt, band, or strap fastener.* Application dated August 14, 1854. (No. 1770.)

The inventor employs a plate of metal, having secured to its back surface three small bars, two forming spaces for the reception of the belts, band, or strap, and the third for that of a broad bent piece of metal, which forms the connecting link, &c.

Taylor, John Withers, and Charles Jackson Taylor, of Nottingham, manufacturers. *The employment of adhesive imitation embroidery to lace, muslin, silk, woollen, cotton, or other fabrics, such embroidery being formed of cut, pressed, or stamped patterns of velvet, crape, or other materials.* Application dated August 15, 1854. (No. 1778.)

In describing this invention, the inventor repeats the title.

Coupland, John, of Southampton, newspaper proprietor. *The preparation and manufacture of a pulp to supersede the use of rags and similar fabrics in the manufacture of paper.* Application dated August 16, 1854. (No. 1780.)

This invention consists in manufacturing pulp from clover, grass, fern, furze, weeds, and rushes, in some cases combining with them a small proportion of flax.

Atkins, Thomas, sen., civil engineer, Oxford. *Improvements in the mode of preparing land, constructing machinery and other apparatus for applying and maintaining an under current arterial circulation of fluid manure, gases, vapours, and air to the seeds and roots of plants.* Application dated August 16, 1854. (No. 1781.)

The inventor proposes to employ tanks, cisterns, or cesspools, fitted with proper induction and eduction valves, which may be reversed at any required time, and ot distribute the fluid manure, gases, vapours, and air through a series of perforated pipes.

Forster, William Charlton, of Hatton-garden, Middlesex. *The manufacture of gas for illumination and heating from materials not hitherto employed for such purpose.* Application dated August 16, 1854. (No. 1782.)

The inventor mixes the refuse bark called tan, after it has been used for tanning, with hops, after they have been used for brewing beer, and with sawdust, in equal parts, and burns them in a retort for the purpose of manufacturing gas.

Manière, Edward, Jean Baptiste, Adolphe Piette, and Jean François Mermet, all of Bedford-row, Holborn, Middlesex. *The conversion of peat into colours.* Application dated August 16, 1854. (No. 1783.)

The inventors dissolve various oxides, nitrates, and sulphates in water, and then mix them with the peat, which is afterwards pressed and left to dry. When perfectly dry it is burnt, and the ashes resulting form the colour.

Higginson, Francis, of King William-street, London, Esq. *Effecting certain improvements in the mode of laying, directing, and aiming with ordnance, ship, garrison, and battering guns, and field-pieces of every description.* Application dated August 16, 1854. (No. 1784.)

Into the centre of the cascable or breech-knob of any gun the inventor fixes a short steel index pin or pointer, which always stands parallel to, and shows the precise direction of, the centre of the gun's bore.

Carr, Robert, chemist, Shrewsbury-road, and William Crossby, miller, Divi-

sion-street, both of Sheffield, York. *Burning or consuming smoke in furnaces and fires for engine-boilers.* Application dated August 16, 1854. (No. 1786.)

The inventor employs a revolving fan, which is fixed in a flue composed of metallic pipes or bricks, by means of which fan the smoke is repeatedly conducted back into the fire.

HAMILTON, EDMOND, of Edinburgh, Midlothian, gentleman. *Improvements in the manufacture or production of beverages or occasional drinks.* Application dated August 16, 1854. (No. 1791.)

The inventor describes a variety of methods of treating fruits and other English productions.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in windlasses.* (A communication.) Application dated August 16, 1854. (No. 1794.)

The patentee describes a windlass having two barrels, so arranged that the rope or chain passes from the first round the second, and then returns round the first, &c., so that as the main barrel is urged round, the rope or chain turns the secondary barrel, from which it passes off to the object to be lifted.

GRIFFITHS, ROBERT, of the Strand. *An improvement in the manufacture of brushes.* Application dated August 17, 1854. (No. 1799.)

These improvements consist in making brushes, the central portions of which consist of wire, while the edges are composed of bristles or other similar materials.

BAKER, WILLIAM, of Birmingham, Warwick, clock and clock-case manufacturer. *A new or improved method of manufacturing the bezils or rings used in glazing the dials of clocks and barometers, and for other like purposes.* Application dated August 18, 1854. (No. 1804.)

This invention consists in making the said bezils or rings of sheet metal instead of casting them.

HILL, JOHN REED, of Princes-street, Stamford-street, Lambeth, civil engineer. *Improvements in machinery for pulverizing metallic ores or other similar hard substances.* Application dated August 18, 1854. (No. 1806.)

The inventor employs "conical rollers, revolving on a horizontal bed plate, and having a circular depression fitted to them."

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Certain improvements in direct-acting marine engines.* (A communication.) Application dated August 18, 1854. (No. 1810.)

This invention consists in transmitting the power of the piston to the crank of the propeller shaft, by a single connecting rod of comparatively great length, attached to a cross head placed at the end of the cylinder opposite to that which faces the propeller shaft.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *An improved composition for fixing lithographs and engravings on canvas, after being transposed or reproduced by a printing press.* (A communication.) Application dated August 18, 1854. (No. 1813.)

The inventor mixes a preparation of gelatine with a solution of linseed water and saccharine matter, and heats the whole to ebullition. The application of the mixture fixes printed impressions.

MATHIEU, FRANÇOIS, of Bartlett's-buildings, Holborn, Middlesex, gentleman. *Improvements in filters.* Application dated August 18, 1854. (No. 1818.)

The inventor describes various forms of filters, in all of which the filtering medium is made up of diaphragms of felt or other similar material, between which are interposed layers of charcoal or other carbonaceous matter.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in the manufacture of hat-bodies.* (A communication.) Application dated August 18, 1854. (No. 1820.)

This invention relates to the application of what is technically known as "hard rubber" to the manufacture of hat-bodies. The material, when in the state of soft sheets, is moulded to the proper form, and is afterwards vulcanized on the mould.

FOX, WILLIAM, and WILLIAM HENRY FOX, of Compton-street, Middlesex, engineers. *Improvements in furnaces to facilitate the combustion of smoke.* Application dated August 19, 1854. (No. 1821.)

This invention consists in providing the interior of a furnace with one or more movable valves or dampers working in frames, and so constructed as to open and shut during the process of firing.

O'NEILL, CHARLES, of Liverpool, Lancaster, joiner. *Improvements in the mode or method of fitting up or fixing the berths in emigrant ships or other vessels.* Application dated August 19, 1854. (No. 1822.)

The inventor proposes to make stationary only a portion of each berth, and to make the other part to slide in and out, either on the lower or upper part of the decks.

SMARTT, GEORGE THOMAS, gentleman, of Doncaster, York. *Economizing the use of grease, oil, or other lubricating articles in axle-boxes.* Application dated August 19, 1854. (No. 1828.)

This invention consists in the use of an

"evaporating surface" on the outer surface of axle-boxes, the supply of the evaporating fluid being maintained either from a reservoir attached to the axle-box, or by means of a tube or tubes.

LAMB, GEORGE NEWTON, of St. Helen's, Lancaster, cement-manufacturer. *Improvements in the manufacture of Portland cement.* Application dated August 19, 1854. (No. 1829.)

This invention consists in the use of the waste arising from the manufacture of soda-ash, known as chemical waste, in and for the manufacture of a cement resembling Portland stone.

SIMPSON, TRISTRAM SHANTY, of St. Ann's-place, Limehouse, Middlesex, carpenter. *Improvements in sashes.* Application dated August 21, 1854. (No. 1833.)

These improvements consist in the construction of sashes with double styles, grooves, and tongues, connected by means of a pivot-joint or other similar contrivance, and placed in such positions that any part of the window or sash requiring cleaning, painting, or glazing, may be moved in any required direction.

*** The documents of No. 1765 are with the Law Officers under objection.

PROVISIONAL PROTECTIONS.

Dated January 13, 1855.

92. John Britten, of Birmingham, Warwick, engineer. An improvement or improvements in the means of filtering liquids.

Dated January 24, 1855.

182. John Livesey, of New Lenton, Nottingham, lace manufacturer. Improvements in lace machinery.

Dated February 3, 1855.

254. Patrick Moir Crane, of Athy, Kildare, manager of works. Improvements in the manufacture of products from peat.

Dated February 12, 1855.

322. John Ramsbottom, of Longsight, near Manchester, engineer. Improvements in the construction of certain metallic pistons.

324. George Lucas, of Hulme, Manchester, mechanic. Certain improvements in machinery for preparing, spinning, doubling, and twisting cotton, wool, silk, and other fibrous materials.

326. Robert Kerr, of Coleman-street, London, architect and surveyor. Certain improvements in preparing loaf sugar for use, and certain apparatus for the same.

328. John Foster, of Long Eaton, Derby, machine builder. Improvements in machinery for the manufacture of lace.

Dated February 13, 1855.

330. Joseph Louis Lambot, of Carces, Department of Var, France. An improved building material, to be used as a substitute for wood.

332. Robert Petrie Comfield, of Upper Holloway, Middlesex, gentleman. Improvements in the electro coating of iron and other metals with zinc and other metals. Partly a communication.

Dated February 14, 1855.

334. Thomas Metcalfe, mechanic, William Blaiding, cotton stripper, and John Metcalfe, mechanic, of Clitheroe, Lancaster. An improvement in the machines for preparing cotton, known as Dyer's tube frames.

336. John Raphael Isaac, of Liverpool, Lancaster, draughtsman. Improvements in the construction of portable buildings.

338. Hugh Lee Pattinson, junior, of Stotes Hall, Jesmond, Newcastle-upon-Tyne. An improvement in the manufacture of iron carriage-wheels.

Dated February 15, 1855.

340. William Blythe, of Oswaldtwistle, Lancaster, manufacturing chemist, and Emile Kopp, of Accrington, Lancaster, chemist. Improvements in the manufacture of soda ash and sulphuric acid.

342. James Leadbetter, of Halifax, York, brazier. Improvements in the mode or method of applying breaks to railway and other carriages.

344. John Mason, of Rochdale, Lancaster, machinist, Samuel Thornton, of the same place, and Thomas Spencer Sawyer, of Longsight, same county, engineer. Improvements in finishing or polishing and drying yarns or threads.

346. Christophe François Delabarre, of Paris, France. Improved apparatus to be used in propelling gases and forcing liquids.

Dated February 16, 1855.

348. Eugène Carless, of Stepney, Middlesex. Improvements in the manufacture of paper-cloth, known as artificial leather, and in coating or covering the surface thereof with colouring matter, said colouring process being also adapted to the colouring or staining of paper.

350. William Carter Stafford Percy, machinist, and William Craven, engineer and tool-maker, of Vauxhall Iron Works, Collyhurst-road, Manchester, Lancaster. Improvements in the manufacture and in machinery and apparatus used in the manufacture of bricks, tiles, pipes, and other articles made from plastic materials.

352 Hugh Lee Pattinson, junior, of Stotes Hall, near Newcastle-upon-Tyne. An improvement in the manufacture of wrought iron tubes.

354. Robert Blackburn, of Wandsworth Paper Mills, Wandsworth, and William Lundi Duncan, of Bridgefield-terrace, Wandsworth. Improvements in bleaching.

356. Andrew Henshaw Ward, junior, of Massachusetts, United States of America. A new and useful or improved loom temple. A communication from Jeremiah C. Tilton, of New Hampshire, United States.

Dated February 17, 1855.

360. John Hackett, of Derby, manufacturer. An improved leather cloth, and the employment thereof for various useful purposes.

362. John Robb, timber merchant, and Laurence Hill, ship-builder, of Greenock, Renfrew. Improvements in the masts and spars of ships and vessels.

Dated February 19, 1855.

364. George Redfield Chittenden, of London, gentleman. Improved apparatus for measuring fluids. A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 6th, 1855.*)

2251. William Green and Joseph Pickett. Improvements in treating or ornamenting textile ma-

terials or fabrics and paper, and in machinery or apparatus for effecting the same.

2266. Joseph Hopkinson the younger. Improvements in steam engine boilers and safety-valves, and in apparatus for indicating the vacuum in steam-engine condensers in relation to the existing atmospheric pressure.

2267. John Welsh. Improvements in extracting liquids from saccharine and other matters.

2278. Louis Vital Helin. Improvements in the manufacture of paper from straw.

2280. William Grindley Craig. Improvements in the mode or method of consuming smoke, and in the machinery or apparatus employed therein.

2284. Charles Henry Olivier. An improved apparatus for drying. A communication.

2286. Peter Armand Lecomte de Fontainemoreau. Improvements in transferring coloured pictures, portraits, and engravings. A communication from Leopold Muller and Antoine Widl, of Vienna, Austria.

2287. James Griffiths. Improvements in the mode or process of manufacturing certain kinds of iron, and in the machinery or apparatus used in such manufacture, part of which improvements are also applicable to machinery used in the manufacture of other descriptions of iron.

2292. William Ashton. Improvements in safety or escape valves.

2298. Jean Pierre Savouré. An improved gold coin detector, applicable also for weighing postal communications.

2303. Gustave Hermann Lilie. A new material for the manufacture of paper.

2313. Charles Vorster. Improvements in the manufacture of ribbons.

2317. Bewicke Blackburn. Improvements in the manufacture of pipes.

2329. James and William Bradshaw. Improvements in time-pieces.

2340. Hyppolyte Bordier. Making alcohol or spirit from different plants and vegetable productions of a farinaceous nature.

2377. Ignace Porro. Certain applications of total or partial reflection of light on transparent surfaces, either alone or combined, with the refraction.

2381. David Tunks. Improvements in watches, clocks, chronometers, time-pieces, and all other instruments for the measurement of time.

2404. David Caddick. Improvements in puddling furnaces.

2418. Richard Archibald Brooman. Improvements in the manufacture of thread from gutta percha and similar gums, in gilding, silvering, and ornamenting the same, before or after being manufactured into fabrics, and in machinery and apparatus employed therein. A communication.

2536. Dominique Bazaine. An improved system of railway, applicable especially on common roads.

2541. Peter Armand Lecomte de Fontainemoreau. Improvements in the manufacture of palm-leaf hats and carcases for hats. A communication from Messrs. Langenhagen, brothers, of Bas Rhin, France.

2561. Peter Armand Lecomte de Fontainemoreau. Improvements in coating and colouring metals and alloys of metals. A communication.

2568. Joseph Phelps. Improvements in apparatus for damping postage and other stamps, labels, and like articles.

34. Benjamin Cook. Certain improved apparatus for separating filings of iron or steel from other metallic filings.

44. Joseph Player. Improvements in the construction of furnaces for the prevention of smoke.

116. Jean Antoine François Victor Oudin. A new liquid for preventing sea-sickness.

194. Richard Archibald Brooman. A power accumulator or apparatus to be employed with hydraulic presses. A communication from Jean Baptiste Falguière, of Marseilles.

211. Peter Armand Lecomte de Fontainemoreau. An improved machine for manufacturing thimbles employed on board ship and elsewhere. A communication.

230. George William Henri. A new compound or meal mixture for feeding cattle.

233. John Smith and James Hollingworth. Improvements in treating certain fibrous materials for manufacturing paper.

236. George Price. Improvements in iron safes, chests, and boxes.

259. Isaie Lippmann. An improved method of dyeing or colouring the hides and skins of animals.

306. William Bridges Adams. Improvements in the construction and application of elastic springs for sustaining loads or moderating concussion in fixed or moving machines or carriages.

356. Andrew Henshaw Ward, junior. A new and useful or improved loom temple. A communication from Jeremiah C. Tilton, of New Hampshire, United States.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed March 2, 1855.

1942. John Henry Pape.
1951. Paul Adolphe Garnaud.
1957. John Youil.
1960. Tony Petitjean.
1963. William Prior Sharp and William Weild.
1985. Charles Wentworth Forbes.
1996. Charles Frederick Stansbury.
1998. Charles Frederick Stansbury.
2022. Joseph Porter.
2026. Martin Billing and George Whitehead.
2046. Thomas Laurence.
2050. Thomas Garnett.
2052. Thomas Banks and Henry Banks.
2092. Thomas Foxall Griffiths.
2093. Thomas Mohan.
2498. Peter Armand Lecomte de Fontainemoreau.
2666. Louis Henry Frederic Melsens.
2687. George Tomlinson Bousfield.
2694. Henry Render.

Sealed March 6, 1855.

1970. Achille Guyardin.
1976. John Rigby.
1977. Edward Palmer.
1981. John Chillcott Purnelle.
1983. Edward Gillman.
1997. Charles Frederick Stansbury.
2003. Thomas Purdon.
2004. Robert Rawlinson.
2083. Auguste Edouard Loradoux Bellford.

2038. William Prior Sharp and William Weild.
2057. Georges Dauré.
2079. Robert Renfrew.
2420. Frederick Joseph Bramwell.

1855.

9. Joseph Arnold.
112. George Jackson.

NOTICES TO CORRESPONDENTS.

Isaac Morgan. — You may depend you have come to a false conclusion respecting the merits of your invention.

Indagator.— The publication of your reply to the letter of "A. H." is unavoidably deferred until the appearance of our next Number.

Our correspondent, whose letter, relating to an advertisement on our monthly wrapper we have mislaid, may, we have reason to believe, rely confidently upon the respectability of the persons named.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

SATURDAY, MARCH 17, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

PATENT IMPROVEMENTS IN REAPING AND MOWING-MACHINES.

Fig. 1.

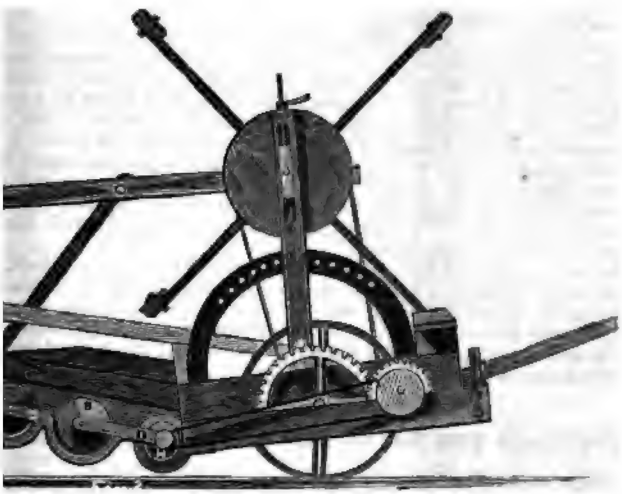
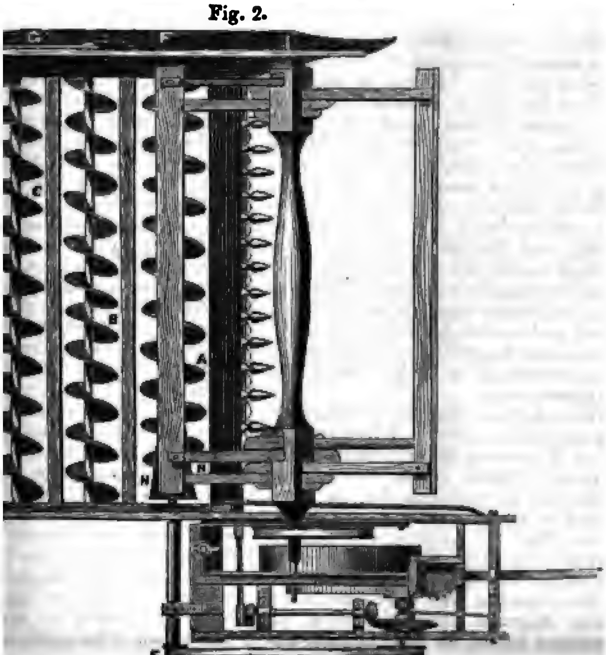


Fig. 2.



BURGESS'S PATENT IMPROVEMENTS IN REAPING AND MOWING-MACHINES.

(Patent dated August 16, 1854.)

Mr. W. Burgess, of the firm of Burgess and Key, the well-known agricultural engineers, of Newgate-street, London, have patented an invention which consists in the adaptation of one or more Archimedean screws to the platform or other convenient part of reaping and mowing-machines, for the purpose of delivering the cut crop to the side of the machine, or of removing it therefrom; motion being communicated to the screws from the running parts of such machines.

Fig. 1 of the engravings on the preceding page is a side elevation, and fig. 2 a plan of a reaping-machine, to the platform of which three Archimedean screws are fitted. A, B, C are the screws; D D are side frames, bolted or otherwise fastened to the platform, in which are bearings for the axes of the screws. The screw, A, is driven by a strap from a rigger, E, affixed on its axis, driven by some running part of the machine. The screw, B, receives motion from a band and rigger, F, mounted on the axis of the screw, A, while the screw, C, receives motion from a band which works over a rigger, G, mounted on its axis, and over the rigger, F. On the shaft of the screw, A, is fitted a conical guard, H, for the purpose of keeping the cut crop clear of the gear of the machine. On the reaper being set to work, the crop will be directed on to the platform by the reel, when the screws will deliver it off from the machine.

The inventor does not limit himself to any particular number of screws, as circumstances may render it desirable to use more or less than the three shown; neither does he confine himself to the described mode of setting the screws in motion, so long as the motion is communicated from some running part of the machine. The positions of the screws may also be so altered that they shall deliver the cut crop at the back of the machine, if it is thought desirable.

DISPUTES IN THE ROYAL AND ROYAL ASTRONOMICAL SOCIETIES.

A review of Mr. Babbage's "Exposition of 1851," which appeared in Nos. 1484 and 1485 of this Magazine, and a letter from Sir J. South, which followed the conclusion of that review, have given rise to discussions of a peculiar character, in both the Royal and the Royal Astronomical Societies. A report of what passed at the Royal Society was given in our number of March 11th, 1854 (No. 1596), and a paper containing comments upon that report, was prepared by the writer of the above-named review, and published in our numbers of April 29th and May 6th, of the same year (Nos. 1603 and 1604). In that paper, the Rev. R. Sheepshanks was strongly urged to produce the defence he was reported to have promised, and to make known the "friend" to whom he had himself imputed the fraudulent importation of a foreign instrument with a forged name.

In December last, Mr. Sheepshanks sent forth a pamphlet, entitled, "A Letter to the Board of Visitors of the Greenwich Royal Observatory, in Reply to the Calumnies of Mr. Babbage, at their Meeting, in June, 1853, and in his Book, entitled, 'The Exposition of 1851.'" As the editorial papers which appear to have afforded the occasion of the public dispute between the author and his antagonists were published in the *Mechanics' Magazine*, during the life of the late lamented Editor, we have hitherto expressed no opinions upon the subject. But as Mr. Sheepshanks has chosen to comment upon the character of our respected predecessor, we feel called upon to take notice of the production of the rev. gentleman. In doing this, we shall not encumber our pages with a discussion of more than a few of the most important points mooted in it.

We may, at the outset, observe, that we write with no hope of affecting either the sentiments or the conduct of Mr. Sheepshanks, providing he is vulnerable to no other weapons than those which he himself wields; for to the use of these we certainly shall not resort. We consider it due to the cause we espouse that we should trust with perfect confidence to the efficacy of those means which *charlatans* are too much accustomed to discard, but which are always sufficient for the execution of an honest undertaking.

In explanation of the unseemly spectacle which Mr. Sheepshanks confessedly presents in offering such a pamphlet to the public at his age ("the shady side of three-score"), he says, "I have been dragged into the shindy against my will; and if my adversaries find themselves with broken heads, it is not my fault."

In order to furnish our readers with some accurate estimate of the intellectual and moral qualities of the reverend author, we will present a few random extracts from the

pamphlet before us, among which are passages which, we confess, quite staggered us when we remembered that they proceeded from one who is either retained or *endured* as a companion of educated men, and of some of the highest public scientific officers of this country. We feel that in reproducing these passages here, we owe some apology; it must be found in the help they afford to the decision of the points at issue between the disputants.

* * "In the correspondence which followed this outbreak, I have no reason to think that Sir James had the advantage, *and I got the last word*."*

* * "And to his reply that he did not care, I told him I would make him care."

* * "I own that when Troughton called Sir James 'a dirty rascal,' I offered no opposition."

* * "I denied, in the flattest and least civil language, the truth of the rest of Sir James's story."

* * "I wanted to return a saucy answer. * * * It gives trouble and costs time to refute civilly, but decidedly, such idle suggestions."

(The reader should remember, that these are the remarks, not of a "vulgar boy" of *sixteen*, but of a clergyman of *sixty*.)

* * "I avoided the temptation of being induced to prosecute a man for whom I felt myself more than a match at his own weapon."

* * "I allow, that though I think myself undoubtedly right in the view I took, the vehemence of language was all on my side."

* * "I gave the most positive denial, and in the least courteous terms, to the graver part of those charges."

* * "Lieutenant Stratford then urged my appointment as secretary" (to the Royal Astronomical Society) "*to keep the President*" (Sir J. South) "*in order*. This disagreeable office I endeavoured to execute, and I believe with some effect; but assuredly this strange official relation caused some unpleasant feeling on both sides, though I am bound in candour to admit that Sir James bore my tutelage, on the whole, very tolerably. The business, however, was so irksome to me, that in February, 1831, I quitted the council, assigning openly as my reason, that I was too busy to attend, but telling my particular friends that I had belled the cat long enough, and was tired of such hangman's work."

* * "I think it will be admitted that I had now given Sir James South sufficient provocation to set loose his tongue, if he had any disagreeable charge to make against me. But before this time he had 'more dirt to eat,' and partly at my hands."

* * "But though I did my honest endeavours to make Sir James's situation unpleasant to him, I cannot claim the merit of driving him away."

* * "Troughton died while the suit was going on, and my conduct on the trial was more provoking than ever."

When it is remembered that the points at issue between Mr. Sheepshanks on the one side, and Mr. Babbage, Sir J. South, and our predecessor on the other, involve questions of honour, honesty, gentlemanly feeling, and moral worth, the above fragments are surely almost sufficient of themselves to decide the matter. It is, however, necessary that other considerations should be suggested.

The title of Mr. Sheepshanks' letter is a misnomer, and was probably adopted for a purpose, which those who are at all skilled in the art of pamphleteering will at once discover. We know of no calumnies of Mr. Babbage, either at the Meeting of the Board of Visitors of the Royal Observatory, or in the "Exposition of 1851." In the latter there appears nothing beyond a narrative of facts founded upon the testimony of the rev. gentleman himself; and the discussion at the Board of Visitors was occasioned by a request on the part of Mr. Babbage for an explanation of the letter, published in our pages by Sir James South. It cannot, therefore, be shown that Mr. Babbage is the calumniator in this matter, unless to seek to purge the Scientific Societies of the land from grave suspicions, or to give publicity to facts which are dangerous while concealed, is to calumniate.

Let us now notice the charges which have been pressed so repeatedly and energetically upon Mr. Sheepshanks, and to treat which his "Letter" is mainly intended, or would have been intended, had not the author sought to transfer attention to subjects of less bitterness to himself. These charges, as *stated* by Mr. Babbage, from Sir J. South's letter, are as follows:

1. Having caused the name of Troughton to be forged upon a foreign instrument, in order to pass it through the Custom-house as an English instrument.

2. That Mr. Sheepshanks committed this forgery for the purpose of defrauding the revenue.

3. That Mr. Sheepshanks applied to Mr. Troughton to allow him to suborn one of his workmen to perjure himself by swearing that the French instrument was made by Troughton.

4. That, failing in this, Mr. Sheepshanks

* The italics are the author's own.

either succeeded in getting some other person to swear to that falsehood, or did it himself.

We frankly confess that we have but little disposition to trouble either ourselves or our readers with such matters as are brought forward here, when they are viewed only in relation to their moral and social turpitude; and did they not connect themselves with other subjects, which fall within our province, and which are of a much weightier character, we certainly should dismiss them without comment. But as they have been shown to ally themselves with much that is of the first importance to men of science, and that dim the lustre of science itself in this country, we cannot refuse to consider them impartially.

The reply to the above charges occupies about *five* pages in the pamphlet of *ninety-two* (!), and we think it right that it should appear here at length. It is as follows:

"An insinuation is clearly made in the first paragraph that I wanted to affix a fraudulent value to a second-rate instrument, by attaching Troughton's name to it. How, then, did the instrument come into Troughton's hands? Surely he was the very last person to whom I should have sent it, if I had wished to pass it under his name, and to the 'injury of his reputation.' I may also ask, in what way could I merit the designation of 'an expert forger?' I could not engrave the spurious inscription, for I was in England all the time; but if I had been in Paris, how could I have taught a French engraver to write like an English one? Troughton's name was (I think) rightly spelt—rather a remarkable thing—but the writing was altogether and unmistakeably French.

That the language attributed to Troughton is 'arrant South,' and quite different from his own genuine Anglo-Saxon, is no solid objection to the *general* truth of the story. Sir James could no more copy, or even recite, the *ipsissima verba* of his 'revered friend,' than Dr. Johnson could make little fishes talk any language but that of big whales. Sir James, professing to quote 'the very words' of his authorities, evidently uses his own. It is desirable that this peculiarity of 'ornamenting everything he touches' (and I wish his license extended no farther) should not be overlooked.

I will now state the real circumstances of the case, and in more detail than I could well do, *vivâ voce*, at the meeting of the Visitors (when I was so unexpectedly called upon), or at the Royal Society, where my condensed defence was so irregularly stopped.

It is known to several members of the Board that I have in my time paid considerable attention to astronomical instruments — and, indeed, was even a sort of authority—until my excellent friend, the Astronomer Royal, took the wind out of my sails. I was particularly smitten with the principle of repetition; and after having purchased a Borda's circle by Troughton (which introduced me to his acquaintance), I was most anxious to obtain a Borda's *reflecting* circle by him. I soon discovered that from Mr. Troughton nothing could be got, and least of all an instrument the principle of which he disliked. In this dilemma, I saw a favourable account, by Sir Thomas Brisbane, of the performance of a circle of reflexion by Jecker, of Paris; and, as a friend was going to Paris, in the winter, I believe, of 1823, I requested him to procure me a circle of Jecker's, and to get Troughton's name engraved upon it, so as to pass our Customs without duty, and without causing him delay or trouble. This was done, and the instrument, I am pretty sure, left by him at Troughton's shop in Fleet-street, to have the inscription erased, and to be adapted to the stand of a British circle which Troughton had recently sold me. It is most probable that the officers at Dover had their attention drawn to the erroneous inscription by the commissioner, and so passed it; but I can say nothing about this of my own knowledge.

I own that I am now heartily ashamed of this transaction, although everybody smuggled in those days, directly or indirectly.* The absurdity and injustice of our fiscal laws were self-evident, and, consequently, few felt bound to obey them. To me, then a student in the Temple (being, as I was already, a free-trader of the first water, and not favourably disposed towards the financial arrangements of an *unreformed house*), the duty on astronomical instruments was particularly ridiculous, the article being as little likely to be imported into England from France in those days, as coals into Newcastle. I should be surprised if the duties on astronomical instruments imported from France into England in ten years from the peace, amounted to as many shillings. The duty, like some others, must have been imposed merely to complete the symmetry of the stupid system of *protection*, now happily disappearing; and had not the poor merit of the laws compelling burials in woollen, and the use of metal buttons; there were no imports on which it could be levied.

* "At that time Bandana handkerchiefs were *contraband*; yet every gentleman, as Mr. Hume remarked in the House, had a bandana in his pocket, from Mr. Speaker downwards."

I had, besides, my own grievances against the Customs, as I suppose most persons had who travelled thirty years ago. From a mistake in form, I had some time before paid the duty upon a Geneva watch *according to the price paid at Geneva*, and not, as the law is, *on the value assigned;* a difference which, in this case, amounted to several pounds. Another time, returning through Brighton, my party and myself were detained several hours in a passage of the Custom-house, while a select portion of the Brighton unwashed was gathered round the doorway; and this because the officer had no competent acquaintance with his duty,* and could not get through his work.

The law being ridiculous and ill-administered, and enacted by an unreformed parliament, I leaned, I fear, to the doctrines of my Cambridge fellow-student, "Alein, the clerk":

'For, John, ther is a lawe that saieth thus,
That if a man in o point be agreved,
That in another he shal be releved."

I looked, perhaps, upon smuggling as a sort of 'reprisals' on an enemy. Whether the idea of putting a false mark to mislead the officers was suggested by my Brighton experience of their stupidity, or by a common practice of traders, or by a wish to triumph over the ignorance of the searchers (the deception was so gross as to give me that sort of satisfaction), I cannot now recollect; I rather think that a wish to spare Mr. —— any delay or trouble in paying the duty was my real motive. The duty itself, on a proper estimation of the instrument, could not have exceeded fifty shillings or three pounds.

I shall scarcely be held to justify this transaction now; as I said before, I am heartily sorry for it. I admit that silly and oppressive laws must be obeyed so long as they continue to be laws; and though, in point of fact, the evasion of such laws has generally been the efficient cause of their removal, I allow that the only proper mode of proceeding is to press earnestly and peaceably for their abolition, obeying them meanwhile. It is not enough to say that the maker of the bad law is more to blame than the breaker. *That is true;* yet the general principle of obedience to law is one too valuable to be broken, in any case, unless where a positively wrong act is commanded to be done. Happily our reforms in the last thirty years have tolerably reconciled our laws with common sense and common fairness; but I ask, and have a right to ask, to be judged by the ordinary practice thirty years ago, when the occurrence took place."

Mr. Sheepshanks next states how *restitution* was made. It appears he imported a theodolite (for which he had previously applied), paying the duty; afterwards, on receiving permission to bring the instrument in duty free, he sought repayment at the Custom-house, but finding how repugnant the refunding of what had once been received was to the usages of the establishment, (that is, being unable to succeed,) he "gave it up!" Thus the Rev. R. Sheepshanks made restitution!!

A few other paragraphs there are in the "Letter" which, in justice to the accused, we give. He says,

"I have already mentioned that the instrument was delivered *directly* by Mr. —— to Troughton, and I am as certain of this as I can be of anything which I don't positively recollect. I am *sure* it did not pass previously through my hands. I remember, most distinctly, that I learned from Troughton's own mouth, how Jecker had executed my commission of engraving his name. There was no need of erasure, he said, for Jecker had engraved his own name, and then screwed over it a small plate with his (Troughton's) name. He said, too, that the work was better than the French work he had formerly seen (I am pretty sure we had not then heard of Gambey, and that Troughton alluded to Fortin's circles), but that he did not like it well enough to adopt it as his own.

Now this is all that passed between Troughton and myself on this matter; I am positive; and as I am sure he never said knowingly anything that was untrue, I assert that the additions with which Sir James has garnished my simple story are the coinage of his own 'base and bitter' imagination. I had nothing to do *personally* with the introduction of the instrument. I never applied to Troughton to procure me false evidence (he was certainly one of the last men to apply to in such a case) nor to any one else, nor did I take any step to procure the admission of the instrument, either by myself or through any other person, beyond what I have already stated. I give the most flat and positive contradiction to Sir James's 'recollections;' and if I do not repeat the still more offensive word which escaped from me when I first heard from Mr. Babbage what

* "The officer, who had been a clerk in the Customs, suggested to the Board that the clerks were more numerous than necessary. On inquiry this was found to be true, *and the reduction extended to himself;* as a compensation, he was sent to Brighton as a searcher. This I learned afterwards from Commissioner R——. So ignorant was this person of his duty, that I was forced to ask him for the tariff, and to teach him the difference between things contraband and those paying duty. He would have charged, but for my interference, a poor French mechanic for three or four books printed in England. Some trifling things were stolen from us on this occasion by the lower officials, but no redress could be had."

I am charged with, it is because I don't know the mental state of Sir James at the time he *published* this story. He might—

> 'Like one
> Who having, unto truth, by telling of it,
> Made such a sinner of his memory,
> To credit his own lie,'—

really have *believed* in 1852 what he had no suspicion of in 1824, nor some years later."

Again: "I will propose to Sir James a few inconsistencies, and I will trouble him or his ally, Mr. Babbage, to clear them up.

"He says, and I suppose Mr. Babbage believes him (we are all agreed, I fancy, to grant implicit credit to Troughton), that I proposed to Troughton to lend me a man to declare the circle of British origin, which Troughton most indignantly refused.* He also says that Troughton, 'a few days afterwards,' repeated this fit of virtuous indignation; but now, *in the presence of the offensive circle, which was quietly occupying a place in Troughton's shop.* Though Sir James does not tell his story very clearly, the meaning must be, that I applied to Troughton (the circle being in limbo) to assist me to liberate it by a false oath, that he most indignantly refused, that I then got it out myself, by making a false declaration, personally or by proxy, and then sent it to Troughton, *as if nothing disagreeable had happened;* that *he took it in with the same nonchalance,* reserving to himself the privilege of *venting his indignation in big words* to Sir James South. It is now many years since Troughton died; but some of the gentlemen I am addressing may remember enough of him to judge whether he could have acted thus inconsistently and weakly. I ask, too, whether such an imputation on Troughton can be rendered probable by such a witness as Sir James South, twenty-eight years afterwards?"

Mr. Sheepshanks afterwards states, that during the year in which Jecker's circle was imported, and subsequent to that occurrence, he, in compliance with a pressing invitation from Mr. Troughton and Sir J. South, accompanied the former to Paris, on a visit to Sir James, and was himself invited to take up his abode with the latter. And this concludes the defence.

From what has gone before, we therefore discover, that of the four charges above enumerated, the *first* is admitted to be true, without change or limitation, by the accused; that the *second* is pronounced by him to be substantially correct, and only requires the substitution of the words "caused to be committed" for the word "committed" to make it literally so; that the *third* is simply contradicted by him; and that the *fourth* is left in an equally unsatisfactory state. With regard to the third and fourth, we may remark, that if Mr. Sheepshanks would have his statements credited, he should undoubtedly produce in evidence the "friend" by whom the transaction was effected, who is clearly able to throw much light upon the whole of the circumstances connected with it. Until the Rev. gentleman does this, and while the allegations of the accuser are met by nothing stronger, and every way more credible than the denials of the accused, there is but one conclusion to which we can arrive. And it must not be forgotten, that much depends upon the truth or untruth of these two charges. If a false oath was necessarily taken by some one, it is clearly of great importance to the disputants to have truly disclosed the part taken by the principal in the matter.

The excuses set up by Mr. Sheepshanks, for the acknowledged fraud and forgery, are two in number: *first,* that the crime of smuggling was felt to be less heinous in 1824, when the fiscal laws of the country were foolish and irritating, than now; and *second,* that the offender is, in 1854, heartily sorry for the offence committed in 1824. It is perfectly just that both these considerations should be allowed to have their due weight; but at the same time Mr. Sheepshanks must not be permitted to claim an acquittal when charged with deliberately instigating *forgery*, on the ground that *smuggling* was popular when the crime was executed, nor can he be allowed to invest with any peculiar merit or dignity that very familiar form of extenuation, "I am very sorry for what I have done, and will never do so any more."*

(*To be continued.*)

ON THE MANUFACTURE OF IRON.

RENTON'S METHOD OF MAKING MALLEABLE IRON DIRECT FROM THE ORE.

[The following paper, which we extract

* "I go further; my vigorous and high-spirited old friend would have kicked any one out of his shop who had made such a dishonourable and insulting proposal; and would have repeated the process, *toties quoties*, if the scoundrel who made it had shown himself there again."

* "We were much astonished at finding our usually just and able contemporary, the *Athenæum* (No. 1415) introducing the defence of Mr. Sheepshanks with these words:—"Before attacking his more immediate opponent, Mr. Sheepshanks gives an account of the Custom-house transactions which Mr. Babbage and Sir James South have exaggerated into a deliberate charge of forgery: and as this charge has been very extensively circulated, it is due to Mr. Sheepshanks that we extract his explanation of the circumstance, and leave it to the judgment of our readers,"—and leaving it with the remark, "This is frank." The entire article, however, appears to be pervaded by an *animus*, to which, if we are not mistaken, we hold the clue.

from "Science and Mechanism," or the Illustrated Catalogue of the New York Exhibition, contains a description of the process of making malleable iron direct from the ore, which was patented by Mr. Renton, of New York, New Jersey, in 1851, and which was spoken of with favour by Professor Wilson in his lecture recently read at the Society of Arts "On the Iron Industry of the United States."]

THE economy of fuel in the manufacture of iron is one of the most important objects which can occupy the ingenuity and research of scientific and practical men. It is well known that the quantity of fuel consumed in making a given quantity of malleable iron, is a considerable multiple of that which would be necessary if a complete economy of the heat could be effected. Every one knows that there are two distinct varieties of iron in use all over the world, which go under the names of *pig* or *cast* iron, and *bar* or *malleable* iron, and most persons are aware also that bar iron is the purest form, and that cast iron owes its brittleness, fusibility, and crystalline structure to the presence of impurities, chiefly carbon, which must be extracted to convert it into malleable iron. Now, although a certain quantity of cast iron will always be required by the world, its fusibility being, for many uses, an indispensable property, yet the quantity used compared with that of malleable iron will always be comparatively very small, and, in fact, nearly the whole of the pig-iron is made for the express purpose of being subsequently converted into malleable iron. This is the almost universal modern practice of making malleable iron, to obtain from the ore, in the first place, an impure and carbonaceous iron by one process, and then to remove, as far as possible, these impurities by another process. In reality, great pains and expense are incurred in the first place, partially for the purpose of introducing into the iron an impurity (for the ore contains no carbon), for the sole purpose of removing which an additional amount of labour and expense is necessary. In this light, the present condition of the iron manufacture seems exceedingly primitive and unscientific. Roundabout as this way is, however, it is far preferable in point of economy to the older "bloomery" process. By this, malleable iron is obtained directly from the ore by one fire, which fire must be fed, however, by the most expensive kind of fuel, generally charcoal; and, owing to the very great quantity of fuel which, from the nature of the process, must necessarily be consumed without contributing to the effect, the process is even less economical than the other, and can only be used where charcoal is very cheap. Still, however, a very great proportion of our very best qualities of iron is made by this process, for example, the Russian iron; the iron from which the Hindoo prepares his celebrated "wootz," or Indian steel, and others. This superiority is due to the greater freedom from impurities of this iron, which is owing to the fact that it comes into contact, during its manufacture, with no other contaminating influence than that of the ash of charcoal, which is comparatively free from those substances which are most injurious to iron. The alkali contained in the charcoal has, undoubtedly, also an important effect, having the property of combining powerfully with all these contaminating substances, thus having a tendency to prevent their combination with the iron; thus it has been proposed recently to use, in the ordinary manufacture of iron, substances containing alkalies, such as wood ashes, soda ash, or even common salt, and the latter substance is said to have been used in England, where it is exceedingly cheap, with marked advantage. It is evident, however, that in this case prevention is better than cure, and that the submission of the iron, during its manufacture, to as few deteriorating influences as possible, is far preferable to the adoption of any necessarily imperfect means of obviating these influences. Thus the process which combines the greatest economy of fuel with the least possible contact of the iron during its formation with the fuel itself, will ultimately supersede all others. Now, in any process of obtaining soft iron directly from its ores, there must necessarily be two distinct stages. All iron ores consist essentially of iron and oxygen, and the first stage of the process must consist in the removal of the oxygen, so as to reduce the iron to the metallic form, and the second, in the agglutination or aggregation of this iron into a dense homogeneous mass, free from all visible pores. Now a fact has been long known to chemists which has a bearing upon the first stage of this process in the highest degree important. This is, that the oxides of iron of which iron ores are composed, do not require for their oxidation or reduction to the metallic form, the intense heat of a blast-furnace; but by the proper deoxidizing agents they may be brought readily into the metallic form by a comparatively low heat. Thus to obtain pure metallic iron for the use of physicians, or the *pulvis ferri* of the pharmacopœias, the practice has been for many years to submit prepared oxide of iron heated in a tube to the action of a current of hydrogen gas, which abstracts its oxygen, forming water. This has undoubtedly suggested the recent improvements which have been introduced into the iron manufacture. It is of course,

however, impossible to employ, in operations on a manufacturing scale, so expensive a gas as hydrogen, and recourse is therefore had to the far cheaper gas called carbonic oxide. The general scheme of all the processes which have been recently proposed for obtaining soft iron directly from the ore, is to crush the ore to a coarse powder, mix it with some carbonaceous matter, also in powder, and heat the mixture in a closed vessel to a red heat until the oxygen of the ore has passed off, together with the carbon, in the form of carbonic acid gas, upon which the metallic iron powder is transferred to a reverberatory furnace, where it is caused, by an intense heat, just as in an ordinary puddling furnace, to agglutinate together into a mass, which the workman, with his tool, can work up into balls, and put under the trip-hammer. The first person who succeeded in accomplishing this practically was an English inventor, by the name of Clay, who heated his mixture of iron and carbon in a gas retort, and after deoxidation transferred it to the hearth of a reverberatory furnace. His patent dates about the year 1840. The process immediately under consideration is an important modification of this. Its peculiarities consist in the heating of the mixture of ore and carbon in *upright flat tubes*, which are heated *by the waste heat* of the reverberatory furnace, this heat being found amply sufficient to accomplish the deoxidation of as much ore as can be balled in a given time. The quantity of carbon, in the form of anthracite, mixed with the ore, is only from 15 to 20 per cent. of the ore. Pure magnetite ore requires for complete deoxidation less than 11 per cent. of pure carbon; but on account of impurities in the coal, and the necessity of using an excess, a greater proportion is found desirable. The time required for the deoxidation depends upon the fineness to which the materials are pulverized; but even lumps of ore of the size of a walnut will be found in the course of a few hours completely converted into iron, the metallic lustre of which is easily developed by slight burnishing. The process which goes on in the interior of the tubes during the deoxidation is undoubtedly as follows: By the combination of the carbon with the oxygen of the ore, wherever the particles of the two are immediately in contact, a portion of *carbonic oxide* gas is formed, which pervades the whole mass, and on account of the porosity of the ore can penetrate by diffusion into the centre of masses even of considerable size, and having the power of combining with twice the quantity of oxygen which it already contains, to form *carbonic acid* gas, gradually combines with and removes the oxygen from every part of the mass. So that this process is precisely the reverse of Boyden's process of converting cast into malleable iron. In this process the object is to remove oxygen, and the affinity of carbonic oxide for oxygen is taken advantage of; while in Boyden's process the object is to remove carbon, and the power used is the affinity of carbonic acid for carbon.

The time and amount of fuel required to make one ton of malleable iron from the ore by this process are about the same, as those required to make a ton of malleable iron from pig in a puddling furnace, thus, as it would seem, saving the whole expense and time required to smelt the ore in a smelting furnace, and accomplishing the same effect within the same time by the use of but one fire, which has been heretofore accomplished with two. But economy of fuel is not the only advantage claimed for this process. The other grand desideratum mentioned above appears to be, to some extent, accomplished, namely, a very much less degree of contact of the iron, during its formation, with the fuel and its contaminating ingredients. Two furnaces on this plan have been erected at Newark, New Jersey, and have been in operation for more than a year. The ore is first crushed by stampers, mixed with 15 or 20 per cent. of pulverized Hazelton, or other superior variety of anthracite coal, which is found preferable even to charcoal for the deoxidation. The mixture is raised by an elevator to the tops of the tubes, which are filled, loosely covered over, and exposed to the waste heat for some hours. The deoxidized iron is then, by the opening of a valve, allowed to fall from the tube and slide down a short inclined plane immediately to the hearth of the reverberatory, where it is balled. During the balling, the silica contained in the ore and in the ashes of the fuel melts down with a portion of the oxide of iron not deoxidized, together with the other impurities present, into a slag, which, from time to time, is drawn through an aperture at the side. A specimen of this slag gave upon analysis 60 per cent. of iron and about 12 per cent. of silica. The loss, however, of iron in the form of slag, owing to the small quantity of this slag, is not greater than in the usual operation of smelting with a flux, and when a sufficient quantity of this richly ferriferous slag has accumulated, it may be smelted in a blast-furnace like any other ore of iron, and converted into pig. These two furnaces make each two tons of blooms in twenty-four hours, which is about the capacity of an ordinary puddling furnace. The cost of making these blooms at Newark, according to the estimate of the Company who have erected the two furnaces spoken of, is less than 30 dollars per ton. One fact must not

be passed over without mention, which is, that silicious ores cannot be worked to any advantage by this process, for carbonic oxide gas has not the power of decomposing silicate of iron, and in working such ores it is always necessary to add lime, for the purpose of decomposing the silicate of iron before a deoxidizing agent will act. No ores are, therefore, adapted for this process but magnetites, hematites, including limonite and specular iron, spathic iron ores, and clay ironstones nearly free from silica.

PROFESSOR CALLAN'S NEW MAYNOOTH SINGLE-FLUID BATTERY.

[The following is an exact copy of the specification of Professor Callan's new patent for improvements in galvanic batteries.]

My invention consists, in the first place, in using, as exciting agents, in all, or nearly all single fluid galvanic batteries, and some double fluid galvanic batteries, for the negative and positive elements, or the negative element alone, certain proportions of sulphuric and muriatic acid with water, either separately or together, and mixed or not mixed with an alkaline or metallic salt; where these solutions are used in exciting both the positive and negative elements, these elements may or may not be separated by a porous diaphragm.

The following are the various solutions, and the proportions in which they are intended to be used.

First. Any solution of sulphuric acid which does not contain less water by measure than acid, if the acid be not below the ordinary strength; nor more than four or four and a half times as great a bulk of water as of acid, unless the acid be above the ordinary strength.

Secondly. Any solution of sulphuric acid in which a cheap metallic salt, such as chloride of sodium, is dissolved, and in which the quantity of water is not less by measure than that of acid, if the acid be not below the ordinary strength, nor more than seven or eight times as great as that of acid, unless the acid be above the ordinary strength.

Thirdly. Any solution of sulphuric and muriatic acid together, in which the quantity of water is not less by measure than that of the acids, if neither of the acids be below the ordinary strength, nor more than four or four and a half times as great as that of the acids, if neither of them be above the ordinary strength.

Fourthly. Any solution of muriatic acid in which the quantity of water is not less by measure than that of acid; if the acid be not below the ordinary strength, nor more than four or four and a half times as great as that of acid.

It will be useful to dissolve in all the above-mentioned exciting fluids, except the second, an alkaline salt, such as carbonate, sulphate, or phosphate of soda, or permanganate or arseniate of potash. The addition of these salts serves to keep the service of the zinc clean.

The batteries for which I claim the use of the above-mentioned exciting agents are those in which amalgamated zinc is the positive element, and iron, copper, platina, or carbon, but especially cast-iron, is the negative element. These exciting agents act most powerfully when the negative element is cast iron.

When great galvanic power is required, I recommend a battery consisting of cast-iron and amalgamated zinc, excited by any of the following fluids, but particularly by the last:

1. Strong muriatic acid diluted with an equal bulk of water.
2. About equal parts of sulphuric and muriatic acid, diluted with an equal bulk of water.
3. Sulphuric acid, diluted with twice, or a little less than twice, its bulk of water.
4. Sulphuric acid, mixed with three times its bulk of a strong solution of common salt.

A cast-iron battery, in which the zinc and cast-iron are very near each other, excited by any of those fluids, will circulate more electricity in a given time than a nitric acid battery. Such a battery I propose to call the Maynooth single-fluid battery, in order to distinguish it from the cast-iron nitric acid battery, which is known by the name of the Maynooth battery, and is a double fluid battery.

In some cases it may be thought desirable to separate the positive and negative elements of a battery excited by any of the foregoing agents by the intervention of a porous diaphragm. The plan may be adopted when it is required to produce uniformity of action, but it is attended with loss of power. Any of the exciting agents hereinbefore described may be used for exciting the negative element alone of some double fluid batteries.

First. When the negative element is iron or cast iron, and the positive element zinc is excited by a different fluid, the two elements being separated by a porous diaphragm.

Secondly. When the negative element is iron, cast iron or a platinized metal, these fluids may be used along with sulphate of copper or of iron, whilst the zinc or positive element is excited by a different fluid, the two elements being separated by a porous diaphragm.

My invention consists in the second place in substituting iron or cast iron for the copper or a solution of sulphate of iron for that of the sulphate of copper used in Daniell's constant battery, or others of similar construction, that is to say, batteries in which the negative element is copper and is excited by a solution of sulphate of copper, and the positive element is zinc, and is excited by a different fluid.

My invention consists in the third place, in using iron or cast iron, and a solution of sulphate of iron for the copper, and solution of sulphate of copper used in Daniell's and other similar constant batteries, so that the negative element will be iron or cast iron, and will be excited by a solution of sulphate of iron.

And my invention consists in the fourth place, in using for the positive element of certain galvanic batteries, zinc coated with an amalgam of mercury, tin and lead, or with an amalgam of mercury, and either of the other two metals.*

ON STEAM AND SAILING COLLIERS.

The discussion following Mr. Allen's paper on the above subject† took place at the Institution of Civil Engineers, on the evening of Tuesday, March 6.

The bag-ballast was admitted to be convenient in some cases, but it was better adapted for long than for short voyages, and the wear and tear of the bags, when in constant use, was a considerable item of expense.

The system of ballasting with water was now generally preferred; the plan of hold water-ballast appeared at the first view to be the simplest, but there might be a doubt whether in heavy weather a vessel, with such a weight concentrated in one part, would not labour and strain. This objection might, to a certain extent, be overcome by having several bulkheads; but it was considered objectionable to divide the hold of a collier ship. Unless, also, the central water-hold was carefully filled and kept up, to provide against any leakage, the mass of water "heeling over" might capsize a vessel.

The system of double-bottom water-ballast, with a timber ceiling, was objected to, on account of the extra original cost, the apparent impossibility of keeping it tight, and the trouble arising from the air. These objections had now caused the system to be regarded as a failure, and it had been superseded by a system consisting of a series of fore and aft tanks, supplied with and kept full of water, from a tank in the fore peak; the discharge being accomplished by pumps worked by a small auxiliary engine. No difficulty had been experienced with this system; there was spare space for extra light cargo, and the ship was easier, on account of the elevation of the centre of gravity.

The objections to the bag-ballast were reiterated: especially when, as in short voyages, the bags required to be frequently moved: instances were given when, in cases of emergency, the working and weeping of these bags had been watched with intense anxiety; on board the *Northumberland* their term of duration did not exceed nine months.

The mid-ship tank, or compartment of the hold, was objected to, on account of the prejudicial effect of such a weight in the centre of the ship, and the division of the hold into three parts.

It was contended that a double bottom of iron, with a ceiling of timber laid on the iron, was superior to any of the other systems; the water only occupied space which was not available for cargo; the increased depth of the floors gave stability at sea, and strength when taking the ground in harbour, or accidentally; the space being sufficient, in all cases, for examination, painting, and repair.

The extra expense of the double bottom was urged as the chief objection to the last system described; the working advantages being admitted.

It was evident that a timber ceiling could never be kept tight; the rolling of the ship produced a partial vacuum, and the oakum was forced inwards by the atmospheric pressure, and the formation of a partial vacuum below.

It was contended that it was preferable to place the weight and bulk of water-ballast in the centre of the vessel, than to have the weight at the extremities; inasmuch as it was better to have the butts of the planks of the deck and upper works in compression, and the timber of the keel in extension.

It was explained, that the flat tanks were so placed in either wing of the hold, that, on their being filled with water, the ship was exactly in ballast trim. With respect to the double iron bottom, it was stated that the cost would not be more than five per cent. in excess over that of either tank or hold-ballast, while the construction insured a safer and more weatherly ship.

* We have here omitted the claims made by Professor Callan in this specification; they will appear in due course among the Abstracts of Specifications recently Filed.

† See last number, p. 222.

NEW RULE OF THE AMERICAN PATENT OFFICE.

A new and important rule, enacted under the advice of the Attorney General, has recently been put in force at the Patent-office, New York, relating to the withdrawal of a portion of the fees paid on rejected applications for letters patent. It is ordered, if the applicant is a citizen he shall be permitted to make oath a second time, after which arguments may be heard for a reconsideration of the case; but if the application is again rejected, the right to withdraw the fees is forfeited. The same rule is observed with regard to foreign applications, when a renewed declaration is made on the part of the inventor by his agent.

REPLY TO "A. H." ON THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—It appears to me that "A. H." and his friend have discovered a mare's nest. I was much surprised to find the statement attributed to me, that a motion of rotation impressed round a principal axis of a body would subsist undiminished, whatever external forces act on it; and I am at a loss now to discover what words of mine have conveyed such an idea. At the risk of being tedious, I will quote my words, only italicising those which ought to have left no doubt on "A. H.'s" mind as to the case in which I understood principal axes were permanent.

"'The principal axes of a body passing through the centre of gravity are permanent,' that is, if he requires explanation, any motion of rotation impressed about such axis will continue uniform and undiminished, *so long as no force acts to retard or check it.*"

I do not see how I could have stated the necessary limitation more clearly.

"A. H." should remember, that when mathematicians state that "the principal axes of a body are permanent axes," they always imply this limitation: the statement of it is quite unnecessary, as no person at all acquainted with natural philosophy would imagine that any kind of motion is unaffected by the action of an unbalanced force.

The remainder of "A. H.'s" remarks on this subject, shows that he strangely misapprehends the matter in dispute in my first letter. Mr. Recordon had undertaken to show that, supposing the moon a *perfect homogeneous sphere*, she must move as she does and in no other way. Accepting this hypothesis, I proved that, even on his own showing, the attractions of the earth and sun must have resultants passing through the moon's centre, and, therefore, exerting no influence on her rotation.

If "A. H." wishes for a proof of this fact, he will find it in the Chapter on Attractions, in "Pratt's Mechanical Philosophy."

Having now shown that "A. H." accuses me of error, without any reason, I will point out an error into which he has himself fallen—I hope inadvertently.

When he says, that my assertion about this attraction "does not follow at all from the above-named property of the principal axes," he either imputes to me an ignorance, which I am not aware that any statement of mine warrants, or shows a want of clearness in his own ideas on this subject. How any person at all acquainted with the true principles of mechanical philosophy could impute to another the notion that any mechanical principle can prove anything with respect to the actual forces exerted in any particular case, I am at a loss to conceive. The process in the mind of a mathematician is exactly the converse of this. Having established the truth of a certain principle or proposition, he inquires, when any case of motion is presented to him, whether the circumstances are such as to make it fall under his principle or not. Now, in th case before us, *supposing the moon a perfect homogeneous sphere*, the mean attractions of the earth and sun on her act through her centre of gravity, and therefore tend to impress no motion round any axis: consequently, as regards rotation, the moon (as we have considered her) is under the influence of no forces, (for "A. H.," as a mathematician, ought to know that when a force has been proved to exert no influence, mathematicians rightly treat it as non-existent) and therefore her motion does in that case fall under the principle stated.

"A. H." seems labouring under the error, that the mere fact that an external force acts on a body places it necessarily and at once out of the sphere of the application of this principle. At least I can draw no other conclusion from these words: "The attraction of the earth is an external force acting on the moon, and, *therefore*, the proposition respecting principal axes being permanent ones of rotation, does not apply in this case."

I should be unwilling to retort upon "A. H." the imputation of ignorance, which he has been so ready to apply to me. But this I will tell him; that his statement, as it stands, without limitation, is erroneous. To make it correct, he should prove that the resultant earth's attraction does not pass through the moon's centre of gravity, and, therefore, produces a moment or couple about an axis through that point. "A. H.,"

if he understands the question in dispute, has been, like many others who have troubled themselves with the moon's motion, "too hasty" in his conclusions.

With respect to the actual case of the moon's motion, I submit that we have no sufficient *data* for founding any mathematical investigation on it. If her shape approaches in any degree to that of a spheroid, as the earth's does; if, that is, the equatorial and polar diameters are unequal, and there is protuberant matter about her equator, then undoubtedly the same investigation as that applied to the earth would show that inequalities, similar to the precession of the equinoxes and the nutation of the earth's mean axis, exist with regard to the moon. But we have no *data* for founding such an investigation on. I am not aware that any astronomer has recorded any observable difference in the magnitude of the moon's diameter, measured in different directions, which must be the case if her form differs perceptibly from that of a sphere. In the case of the earth, precession and nutation arise from the attraction of the sun and moon on the *protuberant* matter about the equator, that is, upon that portion only of the earth which lies without a sphere, described on the polar axis as diameter. The sensible magnitude of this portion arises from the appreciable ratio which the centrifugal force bears to the mean force of gravity. We know that the mean gravitation at the moon's surface is about one-sixth of that at the earth's, while the centrifugal force which depends on the square of the angular velocity and the equatorial radius of the moon, would bear to the centrifugal force at earth's equator a ratio of *not greater* than $\frac{1}{3 \times (29)^2}$ $(=\cdot 0004):1$. Its effect on the form of the moon would consequently be very trifling. Still, however, the difference of the equatorial and polar diameters, though not perceptible, may be sufficient to produce some small effects, similar to precession and mutation in the earth. It must, however, be borne in mind, that with these questions neither Mr. Recordon nor I were concerned. Mr. Recordon had undertaken to prove that on the supposition of the *moon being a homogeneous perfect sphere*, she could have no other motion than that which we know she has. I undertook to prove, *on the same assumption*, that there was no force in his argument.

With regard to my reply to Mr. Recordon, I should certainly have preferred to have been spared the necessity of making it. But as his communication had found a place in your pages, and seemed to favour *the heresy* that the moon has no motion of *rotation* properly so called; and as, moreover, with some of your readers its very obscurity might have passed current for a depth of mechanical reasoning which was unanswerable, I thought it right to say a few words to show this class of your readers the true character of his lucubrations.

I am, Sir, yours, &c.,

INDAGATOR.

London, March 8, 1855.

PROFESSOR W. THOMSON ON THE LUMINIFEROUS MEDIUM.*

To the Editor of the Mechanics' Magazine.

SIR,—As an earnest student and lover of science, I have watched for some years the progress of physical science, and deeply deplore the *scholastic technicalities*, the learned verbosity, and mathematical absurdities,† which too generally characterize modern scientific memoirs, and which so effectually shroud the simple light of truth from popular apprehension.

I feel deeply impressed with the opinion that, if any periodical would undertake (with suitable talent) to analyze and re-represent, in plainest and briefest language, the facts and opinions of scientific progress, that a great boon would be realized in aid of general enlightenment. There are some pretensions in this direction, but nothing at all approaching a sound standard.

What interest such papers as the above-named may awaken in the minds of those who are trained to the formulæ of the schools, I have no means of judging; but I can easily imagine the pain and disappointment of ordinary readers, or working men, like myself, who may wish to form some estimate of these hidden mysteries.

In this case, as in many others, undeterred by the parade of algebra and mathematical treatment, I have laboriously studied the context, in the ardent hope of indirectly realizing some new ideas of truth and beauty in the great economy of physical providence. But the oracles are very exclusive; and with ardent desire, and much effort, the result is painful and humiliating.

But heaven is never unmindful of its humblest, weakest worshippers! The darkest shade is proof of stronger, brighter light! and in some analogous cases I have, from a position of great humility and unpopularity, sent these great men "back to read their lesson anew, and convicted them of blindness and error."

On the subject of *light*, however, I have no pretensions. It is doubtless one of great

* See page 54, current volume.

† Our correspondent appears afterwards to avow his ignorance of mathematical science; how then can he determine what are "mathematical absurdities?"—ED. M. M.

beauty and interest, and might well reward an humble aim and simple treatment. My only hope is to urge other and superior minds not only in the right direction, but in that spirit which heaven rewards. With this motive, and in the spirit of inquiry, I offer the following remarks:

The Professor says: "If we knew the velocities of the *vibratory motions*, we might ascertain the *density* of the *luminiferous medium*; or conversely, if we knew the density of the medium, we might determine the velocity of the moving particles. We may assign a superior limit to the velocities, and deduce an inferior limit to the quantity of matter, by considering the nature of the motions; for the amplitudes of the vibrations must be small fractions of the wave lengths, and therefore the velocities are small in relation to the propagation of light," &c.

There is no doubt that the rate of propagation of sound vibrations varies with the density; but the velocities of the vibratory particles *are not thus related!* With the same density of medium we may vary "the velocity of the particles" by variation of pitch, or by variation of amplitude or intensity; but in both cases, the rate of propagation is unaffected.

2ndly. But does it really mean what it actually says—"The velocity of the moving particles?" for in the context the phrase is varied: "The velocity of the vibratory motions." Is it right or desirable to perplex the humble student, the lowly lover of science, with such grammatico-scholastic and mathematical riddles? The subject itself is not too easy and familiar, and we might fairly desire the plainest and most appropriate language in its treatment.

Supposing that by these phrases is meant the "rate of vibrations;" still we do not see how that would explain the dilemma, for with the *same density*, and the same *rate of propagation*, we may vary the rate of vibrations *ad infinitum*, or *vice versâ*.

However monstrous it may appear, it must mean the absolute "velocity of the moving particles," or the force of the argument, "for the amplitudes of the vibrations must be small fractions of the wave lengths, and therefore the velocities are small in relation to the propagation of light, &c.," would be utterly inapplicable. Every tyro in physics must know, that the amplitude *mainly* determines the velocity of the vibrating particle, *but it has no relation* to the rate of vibration or the rate of propagation!

3rdly. Supposing a ray of light to pass from the sun to the earth, space being uniformly dense (though why it should be so I cannot imagine), yet we know that the media adjacent to the earth increases enormously in density; but do not the "velocities of the vibratory motions" preserve an absolute, or at any rate an approximative *isochronism?* If so, where can be the important connection assumed? This reminds me of Faraday's similar assumption in respect to sound. In his recent Six Lectures, edited by Scoffern, while urging the Paleyan argument, Faraday says, "Nitrogen and oxygen mingle perfectly, because their specific gravity is nearly alike (a very *anomalous* view of the law of gaseous diffusion). If the density were otherwise, then they would have separated, and the atmosphere had been ill adapted for the propagation of sound. Now there is a permanency of sonorous pitch; then the pitch would have been continually varying, and the art of music lost," &c. I cannot but regard this as mistaken in principle. Is not isochronism a necessary part of the law of the transmission of all vibratory force, irrespective of varying density?

I conclude with a quotation from a letter recently written on another subject:—"It by no means follows that this attitude is opposed to mathematical treatment, quite the reverse; but like any other combination of inanimate and unintellectual powers, mathematical science should be duly watched and carefully controlled.

"It is beyond doubt a lever of enormous power, and like the applications of steam, thoroughly indispensable for the requirements of modern science; but it is not less true that its abstract functions are in themselves essentially indiscriminate and unintellectual — that its mighty powers are as equally available for the cause of error as for that of truth—and that its misguided applications are the source of intolerable confusion and perplexity.

"Certain portions of the undulatory theory have been carried to great lengths, and mathematical demonstrations freely supplied only to be laid aside by newer and better treatment; and if I mistake not, the same fate awaits the entire superstructure; and the great theory of undulations, as the exponent of optic and acoustic laws may have to vanish like the baseless fabric of a vision." I am, Sir, yours, &c.,

SAMUEL E. PHILLIPS.

Queen's-road, Brighton,
Feb. 1855.

P.S.—One more kindred illustration of the character of "Modern Popular Science;" from that admirable work, where, of all others, we might most expect perspicuity, at p. 117, No. 7:

"To produce an impression on the ear, but a moderate velocity in the vibrations is

necessary. It appears that a sound may remain audible with a velocity of no more than one-hundredth part of an inch in a second; perhaps with a much smaller velocity even than this."

Here again are the same anomalous relations, which I cannot understand. Is it possible that a vibratory affection, moving at the slow rate of one inch in 100 seconds could be audible? Musical sounds vary from about 30 to 2000 vibrations per second; taking 30 as very extreme, we then have in vibrating a string, say with—

amplitude of	1 in.	a motion of	60 in.	per sec.
"	$\frac{1}{2}$	"	30	"
"	$\frac{1}{4}$	"	15	"
"	$\frac{1}{60}$	"	1	"

ON THE INDICATED HORSE-POWER OF STEAM-ENGINES.

To the Editor of the Mechanics' Magazine.

Sir,—Permit me to offer a few words in reply to the remarks of "Mécanicien" on the indicated horse-power of steam-engines.

"Mécanicien" must be singularly oblivious of the first principles of his art, or he would never venture to present a class of scientific readers, such as the *Mechanics' Magazine* possesses, with the gratuitous piece of information, that pressure, independently of velocity, gives power; for what other interpretation can we put upon his communication in your Number for March 10th, where he says, "there is, I think, no necessity to introduce the notion of time, and consequently of velocity, into the question?" This statement is so palpably absurd, that it requires neither refutation nor comment on my part. He then goes on to tell us, that all we have to do is to find the area of the diagram by Simpson's formula or otherwise, and "the result," says he, "will enable us to calculate the work done by the steam during each stroke of the piston;" by what process we are left to guess, but of course the number of strokes per minute has no earthly bearing on the subject!!

He tells us, in conclusion, that the illustrious Watt, the inventor of the indicator, intended that instrument to show "the state of efficiency of the engine rather than its power," which is no doubt very true; but "Mécanicien" surely will not deny that the indicator is now-a-days universally employed as a means not only of testing the working condition of the engine, but also of finding its power, more especially with a view to ascertaining the comparative economy of engines in regard to the consumption of steam for a certain amount of duty performed.

But I must, in common politeness, acknowledge the "condescension" of Mr. James Emmett, who kindly noticed my letter which appeared in your number for the 17th of February, when no one else would. This gentleman certainly does take a more correct view of the subject than "Mécanicien," insomuch as he admits that time, and consequently velocity, have *something* to do with the calculation; but as he merely says that it is plain to him that the present method of calculation is correct, and makes no effort to prove it so, we are left as much in the dark as before his singularly lucid communication.

But what shall we say for the logic of the following sentence, in which Mr. Emmett evidently loses himself, and forgets that he has admitted previously that it is necessary to multiply by "the space in feet the piston passes through per minute," in order to get at the work performed. The sentence reads thus: "The slightest reflection will convince any one *that it is a matter of perfect indifference what is the velocity of the piston during any portion of either the down or up-stroke of the piston*, since all that is wanted to be known in order to tell exactly the pressure upon each inch of the piston, is the area of the figure bounded by the perimeter made by the pencil of the indicator whilst the engine is making one down and one up-stroke." Mr. Emmett must either be entirely unacquainted with the subject, or he is writing purely at random; for if there is any meaning in the foregoing sentence (which is a matter of grave doubt), it is that since the velocity of the piston does not show the pressure upon the piston, it is perfectly immaterial with regard to the power transmitted, whether the engine makes 4 or 24 strokes per minute!

My reason for condemning the present method of calculating diagrams as given in my letter published in your number of the 17th of February, is briefly, that since the velocity of the piston is constantly varying throughout the stroke, and since the pressure upon the piston also varies (in an infinite variety of ways in different engines) it is impossible, except by the merest chance, to obtain a correct result *by averaging both the pressure and the velocity*; and I there gave some illustrations which I flatter myself will render that fact perfectly obvious to any gentleman practically or theoretically acquainted with the working of the steam engine who will give himself the trouble to look them carefully over.

Now neither "Mécanicien" nor Mr. Emmett advance a single argument to disprove my statement. The former merely says

that he thinks the area of the diagram (which, by the bye is simply the length of the stroke multiplied by the average pressure upon the piston) will enable us to calculate the work performed; whilst the latter makes all the difficulty to consist in finding the area of the diagram, a task which may be performed with sufficient accuracy by any school-boy of eleven years of age, of ordinary intelligence. It is quite clear that neither the one nor the other has very profoundly considered the subject, which is nevertheless one of immense importance, both to engineers and to all parties employing steam power, as the indicator is the only means we possess of testing the comparative merits of steam engines with regard to economy of fuel, and also of showing the saving effected by the use of steam expansively.

I think it would be a benefit to the country at large, and particularly to the manufacturing district thereof, if some other gentleman *thoroughly conversant* with the subject in question, would favour us with his views upon it.

I am, Sir, yours, &c.,

INGÉNIEUR.

Manchester, March 13, 1855.

[In Mr. Emmett's letter, on page 228 of our last Number, col. 2, line 21, the words "each end of the piston," should read "each inch of the piston."]

MECHANICAL ILLUSTRATIONS OF ASTRONOMY.

To the Editor of the Mechanics' Magazine.

SIR,—*Vires acquirit eundo* ought to be the motto of the little controversy I so unintentionally excited on the moon's motion. One of my crudities has effected "a motion of translation" into the columns of the *Moniteur*, and on the 28th of February, the Sorbonne, true to its ancient fidelity as the guardian of the truth, in full sitting, produced a model condemnatory of my heretical views. M. Meret, a stranger to me, but who, it appears, has for thirty years been immersed in that hot water into which I, thirteen weeks since, so inadvertently plunged, has very obligingly sent me from Paris the apparatus, ingeniously contrived and beautifully finished, by M. Robert, the well-known chronometer-maker. A description of this instrument will, I hope, prove both useful and interesting. The principle on which it is based is identical with that illustrated by "J. C." and Mr. Cheverton in the winch-handle and lathe, and in the compass by "Z." and "Dejere," and on which I expressed my views in the too long letter of January last. By means of a driving-band arranged precisely as in the illustrations I proposed in the same letter an axis or axle is made to rotate through the centre of the moon by the act of revolution, and the rotation is made palpably apparent by a steel needle on the surface of her silver crown. This axle, passing up from the drum through a cylinder rigidly attached to the centre of revolution, the moon gazes steadfastly at the earth through the whole period, with a countenance made not quite so lovely as we were wont to gaze on in "Dian's temple" in the old-fashioned clocks, but more appropriately of a somewhat grim and *revolutionary* aspect. I have explained in the above letter (which I certainly must publish when I have a little time) that (what I think) the fallacy of these arrangements, depends on overlooking the strictly and distinct mathematical definitions of the elements of a rotation and a revolution and the axes of motion; but I do not here enter into any controversy, I merely describe a machine ingeniously finished, well worth the attention of my adversaries. By a very neat arrangement of the rigid attachment, the libration of the moon, both in latitude and longitude, is simultaneously exhibited. I could say something on this question, but it would open a deluge of controversy; and as I quite agree with your correspondents on the inconclusive and unsupported reasonings of D. Bernoulli and others, I beg to unite with "A. H." in the hope that some "competent mathematician" will arise to reconcile so many differences, and discover the "physical cause" of the phenomenon. It is, of course, a step in the right direction to know that my errors are so authoritatively displayed. Several machines were suggested during the discussion; and certainly, from this specimen, and a descriptive list of apparatus illustrated by plates which accompanies it, I must say that M. Robert has brought the exhibition of the celestial movements by machinery to a perfection never before witnessed.

I am, Sir, yours, &c.,

DAVID MUSHET.

March 12, 1855.

P.S. Through neglect of dotting an i and crossing a t, last week, I have led your compositor to print "commerce" and "exclusively," instead of "convenience" and "extensively."

PARKER'S FURNACE.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Baddeley still asserts that I had "unjustly designated the smoke consuming apparatus, patented by Mr. Parker, a re-invention;" adding, that "both Mr. Williams's and Mr. Parker's contrivances were each distinct and separate applica-

tions of the well-known principle originally introduced by M. Argand, in the lamp that bears his name." In all this I differ from Mr. Baddeley.

Now, as the "contrivances" here spoken of are identical, being the means by which the air is introduced through numerous orifices punched in an iron plate, if there be any difference, it can only be in the situation or position of such perforated plate. On this head Mr. Baddeley will find the contrivance of Mr. Parker thus mentioned in my Treatise, page 91: "It is a matter of perfect indifference, as to effect, in what part of the furnace or flue the air is admitted, provided this all-important condition be attended to; namely, that the mechanical mixture of the air and the gas be continuously effected before the temperature of the *carbon of the gas*, then in the state of flame, be reduced below that of ignition;" and this very contrivance of Mr. Parker's is given as one of the illustrations of that fact. In that illustration (see figs. 39 and 40 in my Treatise) "the main object being the introducing the air in a divided state to the gaseous atmosphere in the furnace, the upper portion of the plate, projecting three inches above the fuel, was punched with five rows of half-inch holes, through which the air issued in 56 streams." This, it will be seen, is identical with the contrivance called "Parker's smoke-consuming apparatus," and the term re-invention is strictly correct.

Mr. Baddeley then repeats his impression, that I was desirous of ignoring the name of *Argand*, observing that "it is distasteful to me." Having in my last letter shown that my feeling is the very reverse of what that gentleman imputes to me, I need not further refer to it.

I am, Sir, yours, &c.,
C. W. WILLIAMS.

Liverpool, March 13, 1855.

THE BENUMBING INFLUENCE OF ICE.

To the Editor of the Mechanics' Magazine.

SIR,—In a recent communication to the *Lancet*, Mr. Thomas Wakley observes, that "The experience of the last few weeks has proved to my complete conviction, that local anæsthesia can be obtained by the benumbing influence of ice, without resorting to the administration of chloroform. I have tried the ice in several cases, in both hospital and private practice, and in almost every instance the success was evident; the patient, when blinded, being ignorant of the use of the knife. It affords me great pleasure to confirm the evidence of Dr. Arnott upon this interesting subject, and to draw the serious attention of surgeons, both at home and abroad, to this agent."

At page 211 of your present volume is a notice of a patent, taken out by Mr. Blundell, for the application of this agent for the purpose of totally or partially benumbing the desired part of the human body, preparatory to surgical treatment.

From all this, most persons would naturally suppose that the benumbing influence of ice was a most important *modern discovery*. So far from this being the case, the fact has been long known, and publicly practised. It is now nearly ten years since I saw "the benumbing influence of ice" resorted to upon several occasions, at Guy's Hospital, prior to the performance of painful and critical operations, by Edward Cock, Esq. The method then adopted was to partially fill a large bladder with broken ice, and keep it in contact with the part of the body to be operated upon, until the desired insensibility was produced.

I am, Sir, yours, &c.,
WM. BADDELEY.

13, Angell-terrace, Islington,
March 13, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

SMITH, WILLIAM HENRY, M.D., of Philadelphia, United States of America, HENRY BESSEMER, of Baxter-house, St. Pancras, and ROBERT LONGSDON, of Hornsey-lane, engineers. *Improvements in the manufacture and treatment of slag and vitreous substances, and the combination of other substances therewith.* Patent dated August 21, 1854. (No. 1835.)

Claims.—1. A mode of conveying the fluid slag in heated gutters. 2. The use of clay pots in a suitable furnace for the refining of slag. 3. The mixture of colouring or other matters with slag for certain purposes. 4. The pouring together or partially mixing of two or more different coloured slags. 5. The coating of iron surfaces with slag, whether such surfaces are plain or pierced; and also the grinding and polishing of the same. 6. The casting of slag in close, damp sand moulds, and in moulds made of dry loam. &c., &c.

JONES, THOMAS STOFFORD, of Union-court, Old Broad-street, London. *Further improvements to reduce and wash minerals to extract metals therefrom, especially gold.* Patent dated August 21, 1854. (No. 1836.)

Claim.—A pan in combination with a perforated pulverizer and a hollow lower spindle.

GRIST, JOHN, of Islington, Middlesex, engineer. *Improvements in machinery for the manufacture of casks, barrels, and other similar articles.* Patent dated August 21, 1854. (No. 1837.)

An illustrated description of this invention will hereafter be given.

COOLEY, ROBERT BARLOW, of High-street, Nottingham, and of Mercer's-row, Northampton, hatter and glover. *An improvement in gloves.* Patent dated August 21, 1854. (No. 1838.)

Claim.—The employment of elastic web, inserted in the form of a gusset or gussets, in the upper or other suitable part of gloves.

LEES, THOMAS, of Stockport, Chester, machinist. *Certain improvements in the mode of lubricating parts of steam-engines, and of apparatus attached to steam boilers, and in the method of preparing and adapting certain substances for that purpose.* Patent dated August 22, 1854. (No. 1839.)

This invention mainly consists—1. In rendering down raw suet, fatty offal, or other unprepared animal tissue, and extracting the fat or grease therefrom, by means of steam admitted from the vessel or chamber, within which the grease is to be applied; and 2. In the transmission, by self-acting means, into the vessel or chamber aforesaid, of the grease so prepared, in minute quantities and at frequent intervals, in order to effect the diffusion of it over the surfaces to be lubricated.

JACQUELAIN, AUGUSTIN, professor of chemistry, in Paris, France. *Certain improvements in the manufacture of gas for illumination and heat.* Patent dated August 22, 1854. (No. 1840.)

Claim.—1. The manufacture of gas by exposing carbon, either alone or in combination, to an excess of steam at a high temperature, so as to convert the carbon into carbonic acid, which is afterwards absorbed and removed by means of lime or other suitable substance, leaving the hydrogen of the steam in a free state and with little or no admixture of carbonic oxide.—2. The purification of water-gas obtained by any of the ordinary means by exposing it with an excess of steam to a high temperature, so as to convert the carbonic oxide into carbonic acid, which is afterwards absorbed by lime, or otherwise, leaving the hydrogen pure or nearly so.—3. The decomposition of coal-gas, by exposing it with an excess of steam to a high temperature so as to convert the carbon and carbonic oxide into carbonic acid, which is afterwards absorbed by lime, or otherwise, leaving the hydrogen pure or nearly so.—4. The manufacture of illuminating gas, by passing hydrogen gas, manufactured as before described, and free, or nearly so, from carbonic oxide, through a retort containing coal, and heated by a sand bath.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil-engineer. *Improvements in the manufacture of carding apparatus for the preparation of fibrous materials.* (A communication.) Patent dated August 22, 1854. (No. 1841.)

This invention relates to the manufacture and use of wire cards, employed for preparing and carding cotton and other fibrous materials, with curved teeth instead of angular teeth as generally used.

MERIWETHER, JOHN HUNTER, of Morley's Hotel, Strand, Middlesex. *Improvements in the construction of fences and hurdles.* Patent dated August 22, 1854. (No. 1842.)

This invention consists in the use of "undulated or zig-zag wire" as a substitute for the ordinary straight wire in the construction of fences and hurdles.

MERIWETHER, WILLIAM HUNTER, of Morley's Hotel, Strand. *Improvements in producing surfaces for lying, reclining, or sitting upon.* Patent dated August 22, 1854. (No. 1845.)

This invention consists in the use, for the manufacture of the articles named in the title, of "undulating or zig-zag" metallic wires, which are intended to yield to pressure by the expansion of the undulations, and regain their form whenever the pressure is withdrawn.

HANCOCK, JAMES LAMB, of Milford Haven, Pembrokeshire. *An improved pneumatic safety inkstand.* Patent dated August 22, 1854. (No. 1846.)

Claim.—Forming an inkstand, with the reservoir for the ink enclosed, except to a dip-cup, by a diaphragm capable, when depressed at the instant of taking ink, of causing a fresh supply of ink to flow to the dip-cup; and when the supply has been obtained, and the depression is removed, of permitting the ink to return again.

NEWTON, WILLIAM EDWARD, of Chancery-lane, civil engineer. *Certain improvements in carding-engines.* (A communication.) Patent dated August 22, 1854. (No. 1847.)

Claims.—1. The application of two or more pairs or sets of feeding-rollers to the main working cylinder of carding-engines, as described. 2. Reversing the relative velocities of the peripheries of the main working cylinder and stripper, at intervals, by an automatic movement, for the purpose of cleaning or preventing the clogging or packing of the main cylinder.

BLUNT, CHARLES, of Sydenham, Kent, gentleman, and JOSEPH JOHN WILLIAM WATSON, of Wandsworth, doctor of philosophy. *An improved description of artificial*

fuel. Patent dated August 22, 1854. (No. 1848.)

Claim.—The formation of blocks of the fuel, with passages into or through their bulk and substance, for the purpose of admitting currents of the surrounding atmosphere thereto.

SMITH, WILLIAM SHEPHERD, of Charlotte-street, Fitzroy-square, Middlesex, pianoforte manufacturer. *Improvements in pianofortes.* Patent dated August 23, 1854. (No. 1849.)

This invention relates—1. To a mode of arranging the strings or wires of pianofortes, by means of peculiar bridges, the strings being quite straight when wound up for tuning without bearing or pressing on the sounding-boards; and 2. To an arrangement for bringing the bearing of the metallic back-strapping to be made fast in front of the instruments.

NORTON, JOHN, of Cork, esquire. *An igniter or apparatus for igniting explosive and combustible materials.* Patent dated August 23, 1854. (No. 1851.)

Claim.—An igniter or apparatus composed of a pipe-clay, glass, or other suitable tube, charged with a compound explosive by percussion and friction, and hermetically closed at both ends, with or without an external wrapper of water-proof material.

CURTIS, MATTHEW, of Manchester, Lancaster, machinist; WILLIAM HENRY RHODES, of Gorton, in the said county, mechanic; and JOHN WAIN, of Greenacres-moor, Oldham, in the said county, mechanic. *Improvements in certain machines for spinning and doubling cotton and other fibrous substances.* Patent dated August 23, 1854. (No. 1853.)

Claim.—The application of a differential motion, to cause the carriage at the termination of its inward run to be drawn up to and held against the buffers or other stops, while the yarn continues to be wound on the spindles until the position of the fallers is changed.

BÉRARD, ARISTIDE BALTHAZARD, of Paris, France, engineer, and chevalier of the Legion of Honour. *Certain improvements in the manufacture of gas, coke, and other products from coal, and in apparatus for that purpose.* Patent dated August 23, 1854. (No. 1854.)

The inventor says, "If the coal be surrounded on all sides by the heat, the gases will be driven towards the centre of the mass; in accordance with this principle, I have succeeded in advantageously collecting the volatile and gaseous products from a considerable mass of coal, by establishing the outlet for the gas in the centre of the mass." The distillation is conducted by the inventor in closed vessels inaccessible to air.

FAIRBAIRN, PETER, and THOMAS GREENWOOD, both of Leeds, York, machinists. *Improvements in machinery for preparing to be spun cotton, wool, flax, silk, and other fibrous materials.* Patent dated August 23, 1854. (No. 1855.)

Claim.—Applying to one and the same comb-cylinder a taking-comb or combs, and in the rear thereof working combs, which will act upon the pendent end of the fibrous material immediately after it has been discharged from the taking-combs, and while held stationary by the presser bar.

BOUVET, JULIEN LOUIS PIERRE JEAN BAPTISTE HECTOR, of Paris, France. *An improved suction apparatus for pumping and exhausting purposes.* Patent dated August 23, 1854. (No. 1856.)

Claims.—1. Producing a vacuum by the development of flexible bags. 2. Elevating water or any other liquids by moving alternately up and down two columns of the said liquid that are in equilibrio with each other, &c.

BROOKE, WILLIAM, of Martin's-lane, Cannon-street, London, manufacturing chemist. *Consuming smoke, and condensing noxious and other gases and vapours, and converting the products thereof to valuable purposes, which now escape to the injury of animal and vegetable life.* Patent dated August 24, 1854. (No. 1858.)

This invention consists in an arrangement of apparatus by which the products of combustion are caused to pass through a second fire of charcoal, coke, breeze, or other suitable fuel in an ignited state, and from thence, by means of a fan blower, to a condensing and purifying chamber. Also in passing the products direct from the first furnace to the purifier.

HATTER, THOMAS, of the King's-head, Southwark. *Improvements in apparatus for holding strops for sharpening razors.* Patent dated August 24, 1854. (No. 1860.)

The apparatus described consists of a pair of jaws or clamps connected by a pin-joint, and capable of opening and closing, so as to clasp the edge of a table or other fixed surface, and be fixed to it by a screw and nut. A loose leather strap is to be buckled to this apparatus when required.

CHATEAUNEUF, HECTOR GRAND DE, of Paris, France, civil engineer. *Certain improvements in the process and apparatus for washing.* Patent dated August 24, 1854. (No. 1861.)

Claims.—The employment of steam produced in a separate generator at a pressure of two or three atmospheres, and introduced into a hermetically closed apparatus susceptible of resisting the pressure of steam

heated to 260° Fahr., for washing and cleansing clothes. 2. Certain arrangements of machinery for carrying out the foregoing process.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Certain improvements in apparatus for illuminating.* (A communication). Patent dated August 24, 1854. (No. 1862.)

Claims.—1. The substitution of short for long glasses in lamps, &c. 2. A method of replacing the guard-pin at present employed. 3. The employment of perforated caps of different kinds, one of which is called an extender, and serves chiefly to increase the volume of flame by impeding the escape of the gases. 4. The employment of a fine wire-gauze cap, called a protector, above the chimneys to protect the flame. 5. The employment of chimneys with caps for wax candles, especially when used as night-lights or in lanterns.

TUCK, JOSEPH HENRY, of Pall-mall, Middlesex, engineer. *Improvements in packing for pistons, piston-rods, valves, and other uses.* Patent dated August 25, 1854. (No. 1865.)

The object of this invention is to combine a flexible material with an elastic material in such a manner as to cause one to be constantly kept in contact with the rubbing or bearing surface by the elasticity of the other.

BESSEMER, HENRY, of Baxter-house, Old St. Pancras-road, Middlesex, engineer. *Improvements in guns for throwing projectiles for naval and military purposes.* Patent dated August 25, 1854. (No. 1868.)

Claims.—1. The reloading of guns by means of mechanism deriving its motive power partly or wholly from the force of the explosion within them. 2. The reloading of guns by means of mechanism deriving its motive power partly or wholly from a reservoir of water, air, or elastic fluid under pressure. 3. The use of a piston or plunger in guns worked by water, air, or other elastic material. 4. Cleansing and cooling the piece by forcing water through it.

WOODCOCK, WILLIAM, of the Earl's-court Brewery, Brompton, Middlesex, brewer. *An improvement in the construction of furnaces.* Patent dated August 25, 1854. (No. 1869.)

A full description of this invention was given in Nos. 1627 and 1629.)

WALL, GEORGE, of Manchester, Lancaster. *Improvements in machinery or apparatus for the manufacture of pottery.* Patent dated August 26, 1854. (No. 1870.)

The inventor employs a concentric mould made in separate parts, so constructed that the necessary pressure is applied to each part successively, beginning at the centre, by which the pressure is so much reduced, and applied so gradually, that the common absorbent moulds of plaster of Paris will bear it, with the assistance of an iron case or hoop round them. The inventor places a sheet of stretched caoutchouc between the concentric mould and the clay.

GEDGE, JOHN, of Wellington-street South, Middlesex. *Improvements in boring-instruments known as augers, bits, or gimlets.* (A communication.) Patent dated August 26, 1854. (No. 1872.)

The instruments described by the patentee are formed with a "lip commencing at the screw or centre point, and running nearly at right angles thereto, until more than half way from the centre to the outer part, when it assumes a curve upwards or towards the handle end of the instrument, which curve is continued until it is nearly semicircular, or until its extremity turns within the periphery of the auger or bit."

SMITH, WILLIAM, and THOMAS PHILLIPS, of Snow-hill, London. *A new mode of constructing and connecting pipes, or tubes for gas, water, or steam purposes.* Patent dated August 26, 1854. (No. 1873.)

The inventor forms the ends of pipes with bevelled edges, so that when two are brought together they form a groove, and over them is fitted a socket formed in two parts, in the interior of which there is a groove to receive the rims of the pipes. The groove formed by the bevelled edges and the space in the groove of the socket are filled with lead, cement, hemp, or other material for the purpose of producing an air-tight joint, and the two parts of the socket are then screwed together by screw bolts passing through flanges on each part of the socket.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BENTON, ROBERT, of Saltley-hall, Birmingham, surveyor and land agent. *Improvements in marine and railway telegraphs.* Application dated August 22, 1854. (No. 1843.)

The inventor proposes to employ for marine purposes a signal lamp with coloured devices, and for railway purposes an angular tube placed at an elevation of about 15° above the platform of the rear carriage, from which a pair of rockets may be fired in different directions.

BUCHANAN, JOHN, of Leamington Priors. *Improvements in marine engines.* Application dated August 22, 1854. (No. 1844.)

This invention consists in causing the connection of the piston rods to be made from their outer ends, or the ends farthest removed from the shaft.

FROST, HENRY, of Sheffield, York, time-keeper to John Jobson Smith, of Roscoe-place, Sheffield, stove-grate manufacturer. *Improvements in furnaces or fire-places for steam generators and other purposes.* Application dated August 24, 1854. (No. 1857.)

In Mr. Frost's improved furnace or fire-grate, "the coals are placed upon a bed of fire-brick or other suitable material, and the air is admitted over the fire-place."

HORROCKS, JOHN, of Pilkington, Lancaster, machine-maker. *Certain improvements in pin cops, or pin bobbins, or spools for weaving.* Application dated August 24, 1854. (No. 1859.)

This invention consists in forming a screwed thread or coil upon the outer surface of the ordinary pin cops, pin bobbins, or spools, instead of forming them smooth or plain.

FROGGART, ROBERT BECK, of Manchester, Lancaster, analytical and manufacturing chemist. *Improvements in the mode or method of purifying, clarifying, and reducing the specific gravity of oils or fatty bodies, and also of clarifying fermented liquids with the machinery or apparatus used in the said processes.* Application dated August 25, 1854. (No. 1864.)

The inventor employs a large barrel perforated at the bottom, and to each of the perforations attaches bags fitted with taps, through which the oil or other liquid is filtered. He then covers the holes with coarse copper-wire gauze, and places over it a layer of the double sulphate of potassa and alumina, about six inches deep; and then another covering of the copper-wire gauze, and at the top of this a layer of rough animal charcoal about twelve inches deep, with another covering of the copper-wire gauze above it; then a layer of silicated potash, and at the top of all a covering of hair felting about two inches thick.

SKINNER, JAMES THOMAS, of Georgiana-street, Camden-town, Middlesex. *Improved apparatus for rendering the shunts or points of railways self-acting, applicable also to the working of railway signals.* Application dated August 25, 1854. (No. 1866.)

The inventor provides the locomotive engine with a bar or lever which acts as a wedge, and when set for that purpose strikes against a bowle carried by a sliding plate situate between the rails of a line.

DAVEY, HENRY, of Kent-street, Southwark, Surrey, builder. *Consuming smoke in furnaces.* Application dated August 26, 1854. (No. 1871.)

The inventor employs an iron box, open at the bottom, and fixed to the top of the furnace at about two-thirds of the distance from the door to the flue, and reaching from side to side. Through this box hot air is to be supplied to the gases by means of a metal tube passing from the front of the furnace into the box.

KERMOAL, CORENTIN MARIE PERRON DE, gentleman, of Paris, France. *An improved system for preserving and transporting animal and other alimentary substances.* Application dated August 26, 1854. (No. 1874.)

The meat is first partially cooked, together with vegetables, by the inventor, and is then cut into pieces and placed in tin boxes, after having been immersed in a mixture of vinegar, salt, and water. The boxes are filled up and soldered tight, and, with their contents, are subjected for a period to steam of 250° Fahr.

*** The documents of Nos. 1863 and 1867 are with the Law Officers on first reference.

PROVISIONAL PROTECTIONS.

Dated January 30, 1855.

231. Henry Davis Pochin, of Salford, Lancaster, of the firm of Halliday, Pochin, and Co., manufacturing chemists. Improvements in the treatment of certain compounds of alumina, and the application of the same in printing, dyeing, tawing, paper-making, and such like purposes.

Dated February 14, 1855.

335. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in governors or regulators for steam-engines or other prime movers. A communication from Hippolyte Edmond Branche, mechanician, and Charles Coste, merchant, of Paris, France.

337. James Nichol, of Edinburgh, Scotland, bookseller. Improvements in bookbinding.

339. Francis Brown Blanchard, of Maine, United States of America. A new and useful apparatus for generating motive power from heated air, steam, and the products of the combustion of coal or other fuel.

Dated February 15, 1855.

341. Robert Molesworth, of Half Moon-street, Bishopsgate-street, London, brushmaker. Improvements in the construction of brushes.

345. Henry Spencer, of Rochdale, Lancaster, manager. Improvements in machinery for preparing and spinning cotton and other fibrous substances.

Dated February 16, 1855.

347. William Spence, of Chancery-lane, Middlesex. Improvements in substitutes for glass for ornamental purposes. A communication from Emmanuel Ludovico Rapaccioli, of Turin, Sardinia, engineer to the Corps Royal du Génie.

349. William Abbott, gentleman, of Lansdown-place, Richmond, Surrey. A boot and shoe cleaning machine.

353. Fortunato Gaetano Pietro Maria Vittorio Maneglia, of the Turin and Genoa Railway. Improvements in railway carriages.

355. Samuel Barlow Wright, of Parkfields, Stone, Staffordshire, and Henry Thomas Green, of Merton, Staffordshire. Improvements in the manufacture of encaustic tiles.

Dated February 17, 1855.

357. James Wright, of Park-street, Kennington, Surrey, oven-builder. Improvements in the con-

struction of furnaces for the purpose of consuming more effectually than heretofore the smoke contained therein.

359. John Hackett, of Derby, manufacturer. A new and improved fabric or fabrics for the manufacture of umbrellas, parasols, and buttons, and for other purposes.

361. John Oxley, of Beverley, York, coach-builder and wheel-manufacturer. Improvements in machinery for making wheels, or the various parts of which wheels are composed.

363. Robert James Maryon, of York-road, Lambeth, Surrey, mechanician. Improvement or improvements in the construction of and application of steam engines for the better means of transmitting motion and conversion of motion, and of applying motive power.

Dated February 19, 1855.

365. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the manufacture of capsules for stopping or covering bottles, jars, and other similar vessels, and in the machinery employed therein. A communication.

Dated February 20, 1855.

366. George Tillett, of Clapham, Surrey. Improvements in the construction of bedsteads.

367. David Hulett, of Holborn, Middlesex. Improvements in apparatus for heating, cooking, and lighting by gas. Partly a communication.

368. Samuel Bellamy, of Torquay, Devon. Improvements in fire-arms and ordnance.

369. Charles Roper Mead, of Langdale-road, Peckham, Surrey, gas engineer. An improved construction of gas regulator.

370. Albert Louis Thirion, of Asche en Refail, Namur, Belgium. Improvements in pumps.

371. Henry Schottlander, of Paris, France, manufacturer. Improvements in ornamenting looking-glasses.

372. Samuel Kershaw, of Heywood, Lancaster, manufacturer, and James Taylor, of the same place, manager. Certain improvements in carding engines.

373. John Harcourt Brown, of Trafalgar-square, Charing-cross. Improvements in the construction of ball cartridges for facilitating the loading and lubricating of fire-arms.

375. Jean Wothly, of Zoffingen, Switzerland. Improvements in the preservation of meat.

Dated February 21, 1855.

376. Joshua Kidd, of Kildwick, near Bradford, York, and of Bradford, stuff-manufacturer. Improvements in machinery and apparatus for sewing and stitching cloth and other fabrics.

377. Richard Laming, of Carlton-villas, Maida-vale, Middlesex. An improved process for combining the purification of gas with the obtaining of certain valuable products.

378. Benjamin Goodfellow, of Hyde, Chester, engineer. Improvements in machinery for pumping, which improvements are applicable to the air-pumps of steam engines and to other purposes.

380. Thomas Organ, of Birmingham, Warwick, manufacturer, and George Pitt, of Birmingham, machinist. A new or improved dress fastening.

381. George Nasmyth, of Kennington, Surrey, civil engineer. Improvements in preserving animal and vegetable matters.

382. George Heppel, of Preston, Lancaster, gentleman. An improved rotary pump and engine. A communication from John Mortimer Heppel, of Coire, Switzerland.

383. Frederick William Norton, of Edinburgh, Midlothian, manufacturer. Improvements in the manufacture of printed or coloured warp fabrics.

384. John Hyde Pidcock, of Leighton Buzzard, Beds., civil engineer. An improved method of propelling and steering vessels, which is also applicable to the forcing and directing of liquids and fluids.

386. Frederic Prince, of South Parade, Chelsea, Middlesex. Improvements in fire-arms and ordnance.

387. William Maynes, of Stockport, Chester, agent. Certain improvements in self-acting temples to be used in weaving.

388. George Noble, of Sunderland. Improvements in the manufacture of fire-bricks.

389. Paul Prince, of Derby, railway inspector. An improvement in the patterns employed in making moulds for railway-chairs.

390. Charles Low, of Bowoden, Dolgelly, North Wales, gentleman. Certain improvements in the extraction of gold from its ores.

Dated February 22, 1855.

391. Thomas Harrison, of Hackney, Middlesex, ship-owner. A composition for covering and protecting the bottoms of ships and vessels.

392. William Kirrage, of Edmund-street, Camberwell, Surrey, surveyor. Consuming or burning smoke.

393. Robert McConnell, of Glasgow, Lanark, bleacher. Improvements in finishing or dressing textile fabrics.

394. James Bunten, of Glasgow, Lanark, timber merchant, and George Lamb, of the same place, joiner. Improvements in cutting and shaping wood.

395. Peter Clarke, of Manchester, Lancaster, engineer. Improvements applicable to locomotive steam engines. A communication.

396. Walter Neilson, of Glasgow, engineer. Improvements in locomotive engines.

397. Frederick William East, of Bermondsey-street, Southwark, and John Mills, of William-street, Cobourg-road, Old Kent-road. Improvements in destroying the noxious vapours arising from boiling oil, bones, and other matters in the open air.

Dated February 23, 1855.

398. William Hartcliffe, of Salford, Lancaster, machinist, and Joseph Waterhouse, of Manchester, manager. Certain improvements in looms for weaving.

399. Andrew Taylor, of Duke-street, Manchester-square, Middlesex, gentleman. Self-acting railway signals, and apparatus connected therewith, for improving the means of communication between persons in charge of, and the drivers of trains, and to render collisions less frequent on railways.

401. William John Macquorn Rankine, of Saint Vincent-street, Glasgow, civil engineer, and John Thomson, also of Saint Vincent-street, sub-assistant engineer to the East Indian Railway Company. Improvements in machinery for laying subaqueous electrical conductors for telegraphic communication.

402. William Henry Zahn, of Norfolk-street, Strand, London. Certain improvements in wind-mills. A communication.

403. Nicholas Bennett, of Furnival's-inn, Holborn, Middlesex, gentleman. A substitute for the scaffolding at present employed in, and for the erecting and repairing of, buildings, which is also applicable in part to the ventilation of buildings. A communication.

404. John Edmund Gardner, of the firm of H. and J. Gardner, of the Strand, Westminster, manufacturers. Improvements in portable cooking apparatus and in cooking lamps.

405. Simon Martin Allaire, hatter, of Paris, French empire. Certain improvements in hats, caps, and bonnets.

406. Benjamin Looker, junior, of Kingston-upon-Thames, Surrey. Improvements in ventilating stables and other buildings.

407. Nathan Thompson, junior, of New York. Improvements in constructing life-boats.

Dated February 24, 1855.

408. Victor Joseph Lebel, of Paris, Jean Fourniol, of Paris, printers, and Jean Baptiste Remyon, of Paris, merchant. Improvements in typographic presses.

409. Barnaby Angelo Murray, of Dublin, professor of languages. Improvements in winding, doubling, and twisting silk, flax, and other fibrous substances.

410. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in fountain pens. A communication from Newell A. Prince, of New York, United States of America.

411. John Haines White, of Manchester, Lancaster, dentist. An improvement in the method of applying artificial teeth.

412. Joseph Player, John Phillips Player, and Luke Duncan Jackson, of Winchester-buildings. Machinery or apparatus for drying tan, peat, and such like substances.

413. John Scott Russell, of Mill-wall. An improvement in the construction of ships or vessels to facilitate the use of water as ballast.

Dated February 26, 1855.

414. William Brown, of Albany-road, Old Kent-road, Camberwell, Surrey, engineer. Certain improvements in machinery for printing.

415. Hamilton Martin and Joseph Smethurst, of the Guide Bridge Iron Works, near Manchester, engineers. Improvements in the construction of fences or casings for shafts, pulleys, and other parts of machinery.

416. Auguste Edouard Loradoux Bellford, of Essex-street, London. Certain improvements in the application of breaks on railways. A communication from W. Loughridge, of Weverton, United States.

417. Pierre André, merchant, of Paris, France. Certain improvements in grinding-mills.

418. Auguste Edouard Loradoux Bellford, of Essex-street, London. Certain improvements in the manufacture of soda. A communication.

419. James William Spurway, of Monmouth-place, New Cross, Deptford. A travelling pass.

420. Alexander Brown, of Tarbet, Dumbarton, engraver. Improvements in the manufacture of paper, and in the production of textile materials.

421. Charles Henry Roberts, of Cornwall-road, Lambeth, Surrey. An improvement in the manufacture of rubbers for painters and others.

422. Thomas Nash, junior, of Great Dover-road, Newington, Surrey, brush manufacturer. Improvements in painting-brushes, applicable also to other brushes and to brooms.

423. William Armand Gilbee, of South-street, London, gentleman. An improved process of manufacturing alcohol from the stem and ear of maize. A communication.

Dated February 27, 1855.

424. William Armand Gilbee, of South-street, London, gentleman. An improved soap to which he gives the name of saponitoline. A communication.

425. James Brodie, of Bow of Fife, North Britain, clerk. Improvements in, and applicable to, tongs, pliers, vices, and other holding instruments.

426. Alfred Jean Berchtold, engraver, of Paris, French empire. Certain improvements in applying the photographic engraving on metals or other materials.

427. Henry Gardner, of Arthur-street, Old Kent-road, Surrey, gentleman. Certain improvements in the construction of horse-shoes, and in shoes used for the shoeing of hoofed animals.

428. Joseph Cooper, of Lionel-street, Birmingham, Warwick, brace and bit manufacturer. Certain improvements in joiners' braces, and in the mode of forming or partially forming the various bits to be used with such or any other kind of brace.

429. Benjamin Fothergill, engineer and nist, and William Weild, engineer, of Man Lancaster. Improvements in machinery fo ing cotton, wool, flax, silk, and other fibro terials.

430. William Campion, of Nottingham. improvements in knitting machinery.

431. Alexander Theophilus Blakely, of Ryder-street, St. James's, Middlesex, ca the Royal Artillery. Improvements in ord

Dated February 28, 1855.

436. Jesse Brickles and Thomas Thorpe, facturers, and Joseph Lille, engi eer, of M ter. Improvements in the manufacture and ornamental woven fabrics.

438. Ward Holroyd, of Queen's Head, ne fax, York, manager. An improved me fencing horizontal and other shafts in and other places where such fencing ma quired for the purpose of preventing accid

440. John Gedge, of Wellington-street Middlesex. Improvements in apparatus chinery for stopping or retarding vehicles railways. A communication from Sophia of Gorlitz Prussia.

442. Benjamin William Goode, of Birmi Warwick, manufacturer, and Nehemiah of Birmingham, machinist. A new or in fire-arm.

444. Edward Taylor Bellhouse, of th Foundry, Manchester, Lancaster, engine Thomas Cowburn, of the same place, e Improvements in vacuum valves and safety

446. Thomas Cook, lieutenant, R.N., p of fortifications, of Addiscombe, Surrey. I ments in working punkas and apparatus fo ing air in churches, hospitals, and other bu

448. Henry Penney, of York-place, Bake Portman-square, Middlesex, varnish mak improved mode of treating vulcanized o India-rubber.

PATENT APPLIED FOR WITH COM SPECIFICATION.

434. James Reddie, of Anstruther, Fi monger. An improved metal shovel. 28, 1855.

NOTICE OF APPLICATION FOR I TO FILE DISCLAIMER.

An application will be made to Her Attorney-General by William Thomas, of side, London, merchant, for leave to ent claimer of part of the Specification of Le tent granted to him 1st December, 1846, fo provements in machinery for sewing or various fabrics."

APPLICATION FOR PROLONGATIC JUCKES' PATENTS.

The application for prolongation of th mentioned patents is to be made on the April next, instead of the 29th March, as pr stated, (No. 1646, p. 190.)

NOTICES OF INTENTION PROCEED.

(*From the "London Gazette," Mar* 1855.)

2328. Loring D. Dewey. Protection in vessels or buildings, by putting ou without personal aid, or with very lit against incendiary or fraudulent fires and

of vermin. He is the true inventor of it in part, and proprietor of the whole.

2332. Nathaniel Topp, John Holt, and John Partington. Improvements in hand-mules for spinning.

2337. George Lee Baxter. Improvements in reaping-machines.

2364. James Whitehead. Improvements in self-acting mules.

2373. Paul Pretsch. Improvements in producing copper and other plates for printing.

2394. Eugene Rimmel. Improvements in combining matters to be employed in coating fabrics and leather, and for other uses in substitution of India-rubber. A communication from Hippolyte Magen.

2396. William Kleen. A new or improved method of ornamenting and attaching labels, cards, window, and other bills.

2414. George Bodley. Improvements in revolving cannon.

2427. Auguste Edouard Loradoux Bellford. Improvements in silk-winding machinery. A communication.

2433. William Low. Improvements in ventilating mines.

2437. James Higgins and Thomas Schofield Whitworth. Improvements in apparatus for moulding for casting shot, shells, and other articles.

2453. Pierre Alexandre Dulaurens and Marie Anatole Laubry. Certain improvements in glove-fixings (or fastenings.)

2463. Jean Baptiste Bagary. Improvements in sawing apparatus.

2591. Richard James Morrison. Improvements in propelling ships and vessels.

2696. Gustave Irenée Sculfort. Certain improvements in manufacturing screw plates.

2747. Ashton Stansfield and Josiah Greenwood. Certain improvements in power-looms for weaving.

6. Bashley Britten. A cheap and convenient method and apparatus for obtaining a copy of writings, drawings, or tracings in ink.

8. Henri Louis Dormoy. Certain improvements in manufacturing and twisting silk, cotton, wool, and other fibrous substances. A communication.

124. James Webster. Improvements in the application of motive power.

199. George Bell. Improvements in constructing air springs. A communication.

207. John Hutchinson. Improvements in apparatus to economise steam.

212. Henry Nightingale and Robert Nightingale. Improvements in machinery or apparatus for slubbing, roving, and spinning cotton, and other fibrous materials.

231. Henry Davis Pochin. Improvements in the treatment of certain compounds of alumina, and the application of the same in printing, dyeing, tawing, paper making, and such like purposes.

247. Alexander William Williamson. Improvements in apparatus for feeding fires.

254. Patrick Moir Crane. Improvements in the manufacture of products from peat.

318. Alexander Sands. An improved fastening or detainer to be employed as a substitute for clothes-pegs, or for other similar purposes. A communication.

319. Louis Adolphe Ferdinand Besnard. An improved composition for fixing lithographs and engravings on canvas, after being transposed or reproduced by a printing press.

337. James Nichol. Improvements in book-binding.

339. Francis Brown Blanchard. A new and useful apparatus for generating motive power from heated air, steam, and the products of the combustion of coal or other fuel.

340. William Blythe and Emile Kopp. Improvements in the manufacture of soda-ash and sulphuric acid.

347. William Spence. Improvements in substitutes for glass for ornamental purposes. A communication from Emmanuel Ludovico Rappaccioli, of Turin, Sardinia, engineer to the Corps Royal du Génie.

353. Fortunato Gaetano Pietro Maria Vittorio Maneglia. Improvements in railway carriages.

361. John Oxley. Improvements in machinery for making wheels, or the various parts of which wheels are composed.

365. Richard Archibald Brooman. Improvements in the manufacture of capsules for stopping or covering bottles, jars, and other similar vessels, and in the machinery employed therein. A communication.

377. Richard Laming. An improved process for combining the purification of gas with the obtaining of certain valuable products.

381. George Nasmyth. Improvements in preserving animal and vegetable matters.

388. George Noble. Improvements in the manufacture of fire-bricks.

389. Paul Prince. An improvement in the patterns employed in making moulds for railway-chairs.

394. James Bunten and George Lamb. Improvements in cutting and shaping wood.

410. John Henry Johnson. Improvements in fountain-pens. A communication from Newell A. Prince, of New York, United States of America.

426. Alfred Jean Berchtold. Certain improvements in applying the photographic engraving on metals or other materials.

430. William Campion. Certain improvements in knitting machinery.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed March 9, 1855.

1988. William Nash and John Jewell.
1990. Auguste Edouard Loradoux Bellford.
2001. William Bramwell Hayes.
2007. John William Perkins.
2032. Auguste Edouard Loradoux Bellford.
2036. Auguste Edouard Loradoux Bellford.
2068. George Spencer.
2076. Jonathan Edge.
2139. Thomas Edwin Moore.
2226. Auguste Edouard Loradoux Bellford.
2580. Frederic Jolly.
2610. Christian Henry Richard Ebert and Lippmann Jacob Levisohn.
2688. Robert Walker.
2744. James Nasmyth.

1855:

154. Charles Van den Bergh.

Sealed March 13, 1855.

2023. James Kershaw.
2045. Henry Holland.

2060. Robert McConnel.
2089. Charles William Lancaster.
2127. John Kershaw.
2134. Thomas Crossley.
2141. Enoch Oldfield Tindall.
2423. James Buchanan.
2761. Thomas Slater and Joseph Tall.

1855:

41. Charles John Edwards, jun., and Frederick Frasi.
71. John Norton.
79. Auguste Edouard Loradoux Bellford.
100. Joseph Edlyn Outridge.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned therein.

NOTICES TO CORRESPONDENTS.

C.—We will publish the papers you kindly sent in our next number, if we can make room for them; if not then, as soon as is convenient.

R. M.—We purpose publishing a description of the pump you mention at our earliest opportunity.

G. A.—Your questions, which came to hand late, shall be replied to in our next.

T. B.—Yours reached us too late for insertion this week.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1650.] SATURDAY, MARCH 24, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

TENDALL AND TROTTER'S PATENT ORE CRUSHER.

Fig. 2.

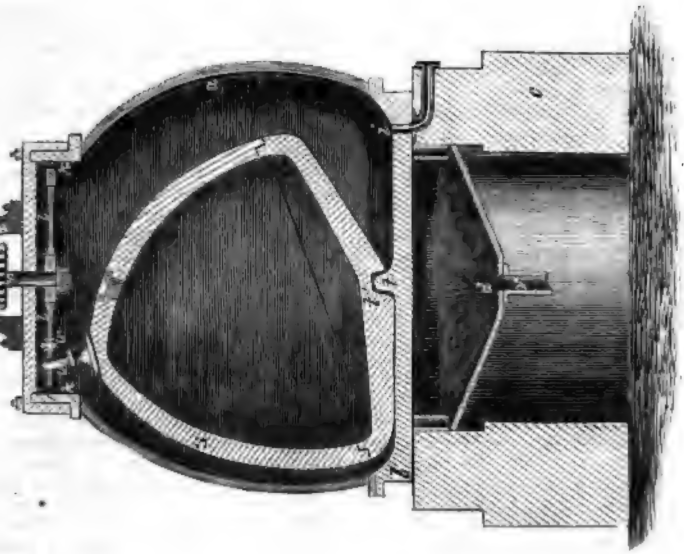
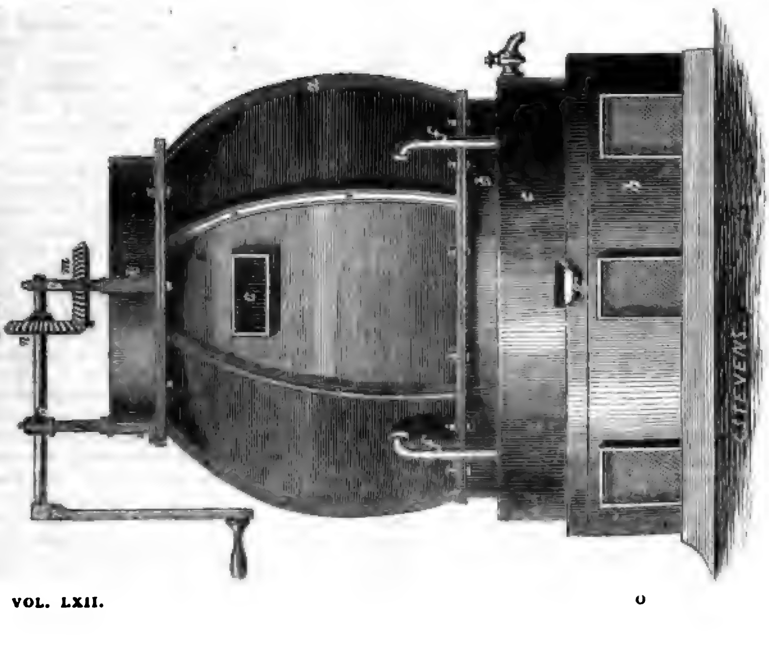


Fig. 1.



TENDALL AND TROTTER'S PATENT ORE CRUSHER.

(Patent dated January 27, 1854.)

MESSRS. TENDALL and TROTTER, of London, have patented improvements in machinery for crushing, washing, and amalgamating ores, which consist in the employment of a heavy body, the base of which is made to form an acute angle on either side of a perpendicular line drawn through its centre, and which must be tilted upon one side in order to make it revolve upon its base. The body, which is by preference of a conical form, revolves in a metal basin, and is held therein by a pin projecting upwards from the centre of the basin; this pin fits into an aperture in the bottom of the crushing body, the upper part of which is held by a pin which fits into a slot cut in the arms of a wheel connected with bevil gearing, by which the body is put in motion. "From the peculiar form of this crusher, and the manner in which it is supported," say the inventors, "a cone of considerable weight may be caused to revolve with a trifling expenditure of power."

Fig. 1 of the engravings on the preceding page is an elevation, and fig. 2 a vertical section of the machine. "*a a*," says the specification of the patentees, "is a stout wrought or cast-iron casing, formed in sections or parts for convenience of carriage; these are secured together by means of bolts and nuts, as shown. The casing is secured in a similar manner to a heavy wrought or cast metallic basin, *b*, in which the crushing body rotates; the basin, *b*, rests upon and is supported by a strong wooden or metallic framing, *c*. Below the basin and within the framing is a pan or trough, *d*. One or more openings, *e*, are made in the casing, *a*, and through these openings the material to be crushed is fed, either by hand or by hoppers, or other suitable means adapted to the particular use to which the machine is applied. *f f* are pipes or shoots for conveying the ground substance to the trough, *d*; the apertures in the casing, *a*, leading to these pipes or shoots are covered with wire net work, to prevent all but the finest particles passing through. *g* is a channel for conveying the pulverized matter to the trough, *h*, which is fitted with a series of wire work screens which retain all the solid matter within the trough, the refuse water alone passing through them. *i* is a tap by which the water and other matter in the lower part of the machine may be run off when desired. To the upper part of the casing, *a*, is bolted the rim, *k*, within which the horizontal wheel, *l*, rotates, to the axis of which is keyed a bevil wheel, *m*, in gear with a similar wheel, *n*; the shaft, *o*, of the wheel, *n*, is supported by bearings, *p*, fitted in the standards, *q q*; to the outer end of the shaft, *o*, is fitted a handle, *r*, if the machine is to be actuated by manual power, or with bevil gear or fast and loose pullies, if steam power be used. The form of the crushing body, which we designate the 'cone,' and internal arrangement of the machine are shown by fig. 2. *s* is the metal cone; this may be cast or wrought in separate parts for more readily conveying it from place to place; the base of this cone forms two acute angles, with a perpendicular line drawn through the centre of it. The upper part of the cone terminates in a solid pin or stud. An aperture is left in the side of the cone, so that it may be filled with any solid or liquid body to increase its weight. When the cone rests on the basin of the machine it leans over upon one side, the whole of its weight being thrown upon the comparatively small space immediately beneath it, and it is retained in this position by the pin, *t*, which projects from the centre of the basin and fits the orifice, *t*, in the base of the cone; the pin *u*, at the top of the cone passes through a slot in the wheel, *l*; the slot is made long enough to allow the pin, *u*, to traverse to and fro therein; at the inner end of the slot a piece of vulcanized India-rubber, *w*, is secured by a wedge. The object of this arrangement is to allow the cone to roll over any large pieces or other substance that may get beneath it; the pin, *u*, traversing freely in the slot of the wheel, *l*, admits of this freedom of motion, the India-rubber lessening the effect of a sudden jerk. When the machine is put in action a quantity of quartz or other mineral or substance to be crushed is put into the machine by the apparatus, *e*, and a sufficient quantity of water added to it; the cone is put in motion, and the ground material flows through the tubes, *f f*, into the trough, *d*, and from thence the lighter portion is carried off through the channel, *g*, by a stream of water supplied to the machine, to the trough, *h*, the wire network placed before the openings of which arrests all the solid substance, allowing only the water and soluble matters to run off to waste, leaving the finely-ground mineral perfectly washed, and in a fit state for any subsequent operation. If the process of amalgamation be performed simultaneously with the crushing, then a quantity of mercury is put into the trough, *d*, by removing one of the pipes leading thereto, or a separate channel or tube may be fitted for the purpose; the trough, *d*, may be heated to the requisite temperature either by steam or other convenient means. As

the gold combines with the mercury the pulverized quartz is carried off as before described; the amalgam may be removed from the trough, *d*, by a pipe or tube, *v*, fitted to the bottom.

"In the foregoing we have described the improved crushing machine, and its application to crushing quartz and other minerals only, but it will be obvious that the machine is equally applicable to the crushing and grinding of other substances and materials as well as minerals."

DISPUTES IN THE ROYAL AND ROYAL ASTRONOMICAL SOCIETIES.

(Concluded from p. 246.*)

We are fully persuaded that the "Reviewer" mentioned in our last paper must have known Mr. Sheepshanks well, and have acted upon his knowledge, when he urged the reverend gentleman to publish his defence. It was, to say the least, an "unkind cut." For it is evident that no one could have dealt more injuriously with the case than the defendant. He sadly lacks mastery both of himself and of his subject. Pity that he had no "friend" at his elbow with gentleness enough to purge his sarcasm of some of its savageness, and with sense enough to have instilled a little more wisdom into his wit!—to have put into the hand of the combatant the handle and not the blade of his weapon—to have furnished him with other missiles than those of the boomerang character, which return and smite the sender!

Throughout the "Letter" there is a sad deficiency of tact, polish, and *literary address.*

> "What boots it, thy virtue?
> What profit thy parts?
> While one thing thou lackest,
> The art of all arts!
> The only credentials,
> Passport to success,
> Opens castle and parlour—
> Address, man, Address!"

Mr. Babbage, we should think, could wish for no ampler or more elaborate confirmation of the alleged habit of "disparagement" practised by Mr. Sheepshanks than is to be found in the pages of the "Letter" before us. In it so unmitigated are the depreciatory passages, particularly those directed against Sir J. South, that the author must have written them in entire forgetfulness of the fact,

> "That he *goes the farthest* who goes far enough,
> And that all beyond that is just bother and stuff."

We shall not occupy ourselves with a reply to his profuse and contradictory criticisms of Sir James's character and abilities. When it is remembered that the author is Mr. Sheepshanks, and the subject he who gave to the light the humiliating transactions of that gentleman before discussed, there will be no room to wonder at their bitterness, and no necessity, we conceive, to demonstrate their injustice. If Sir James thinks otherwise, it will certainly cost him but little trouble to deal effectively with that which contains its own refutation.

We may, however, remark, before passing to new considerations, that the alleged continuance of the intimacy of Sir James with Mr. Sheepshanks after the Custom-house transaction may be susceptible of many satisfactory explanations. For instance, it may have resulted from a peculiar *pertinacity* in the companionship of Mr. Sheepshanks. It is not always in the power of a man to break effectually with a disagreeable associate; and it is not every Glanville (to take rather a bad illustration) that has a devoted Pelham to liberate him from the insolent intrusions of a boisterous Thornton. Then, again, what force is there in the appeal, "I think it will be admitted that I had now given Sir James South sufficient provocation to set loose his tongue, if he had any disgraceful charge to make against me," when it has already been admitted by Mr. Sheepshanks himself, that Sir James had the disgraceful charges of fraud and the authorization of forgery to make against him, and yet withheld them until 1852? But we must pass on.

The difficulties met by Mr. Sheepshanks in dealing with the statements of Mr. Babbage must certainly have been great, and his reply demonstrates his embarrassment. Mr. Babbage is a man of acknowledged genius and probity. We know of no living author or man of science who has given more striking proofs than he of the possession of those faculties by which the boundaries of knowledge are extended and the mechanical arts improved. It may be true that less has proceeded from him than might have been anticipated, judging from his early literary efforts, and from the uncommon mental resources which were exhibited in the conception and development of those calculating machines, which have rendered his name famous in all cultivated communi-

* *Erratum.*—In the former part of this article the clause "(for which he had previously applied)," on p. 245, col. 2, lines 12 and 13, should have followed the words, "permission to bring the instrument in duty free," lines 14 and 15.

ties. But if it should be shown, as it probably might, that his action has been restricted by the machinations of men who, having not a tithe of his genius, have contrived to encumber his path with unnatural obstructions, the fact would only serve to arm us with indignation against his adversaries. But be this as it may, the past labours of Mr. Babbage have been sufficiently illustrious to give to him a very eminent position in the world of science, and to shed over his name a brightness that is associated only with extraordinary endowments. In assailing the positions of Mr. Babbage, Mr. Sheepshanks is therefore compelled to resort to the use of other instruments than those he would have employed against a less protected opponent. His ingenuity furnishes him with three modes of assault, which are all that we think it necessary to mention here.

He first suggests that Mr. Babbage, in all that relates to the reverend author, is the victim of maniacal hallucinations. He says, "To this gentleman I have been for some years a very bugbear,—one to whom he has ascribed all sorts of injuries, calamities, and persecutions, and with such confidence that I fear some unsuspecting people, ignorant of his malady, may believe him. I have no hope of removing his monomania, nor, so far as I am personally concerned, do I mind what Mr. Babbage may think of me. I know I should be very sorry to be tried for burning St. Paul's, if he were on the jury, at the Old Bailey. *I fear he would find me guilty, and starve upon it, though he had seen the church safe and sound the moment before he took his place in the box.*" This is, indeed, gross writing. Of course, Mr. Sheepshanks loses no time in abandoning so absurd an hypothesis as he here puts forth; but then what can be thought of an individual who feels no compunction in dealing thus unscrupulously with the characters of eminent men? If he can go to such lengths "upon the housetops," what would he shrink from speaking "in the ear in closets"? Does he not himself put it out of our power to believe him incapable of almost any "disparagement"? Let our readers contrast the foregoing paragraph with the spirit and manners that are common among instructed persons, if they would truly estimate the character of the writer. As we read it, we can but recall to mind the language of a respected correspondent, whom an untimely death has recently removed from us.* Making allusion, in a private communication, to a charge brought against him by an individual who, though far less rude than Mr. Sheepshanks, had written with rashness, he says, "When he accuses me of dishonourable conduct, he makes my whole man sick."

We have no wish to exaggerate the faults of Mr. Sheepshanks. To see him continually wounding his own reputation, as he does throughout this "Letter," gives us, we are certain, more pain than he is able to conceive. But we must not sacrifice the greater to the less. If the author had exercised his bellicose and mischievous propensities in a less presumptuous manner, we should have held our peace; as it is, we are compelled to effect his condemnation by quoting his defence.

Mr. Sheepshanks having to resort to a charge of madness against Mr. Babbage, as a cover for his own defence, afterwards adopts another common but extreme expedient in further attempting to weaken the effects of the simple but severe statements recorded in the "Decline of Science" and the "Exposition of 1851." He says, "Mr. Babbage wished to be secretary" (of the Royal Society), "and he conceived that the president (Davy, I believe) was favourable to his appointment. Whether Davy changed his mind, or whether Davies Gilbert, who succeeded him, did not hold himself bound to carry out the intention of his predecessor, or whether Mr. Babbage deceived himself, I do not know; but I do know—for I heard it from Mr. Babbage—that he quarrelled with the Royal Society because it did not get rid of the president, who had done him such an injustice as to reject him as secretary. He had a notion, too, which struck me at the time as a very crazy one—that there was some underhand dealing, and that he had been invited to be a candidate to give *éclat* to Captain Sabine. With this key, I think 'The Decline of Science' will be much more intelligible to the general reader (if any reader there be of that work) than it has been hitherto."

To say that the source from which charges of this kind spring is so common among men that they are listened to with eagerness, is only to add another to the many existing examples of human depravity. It is quite true that men have an appetite for imputations like the foregoing, and but few, we should think, understand the craving better than Mr. Sheepshanks. He doubtless knows, also, how rapidly and effectually the leaven of their influence spreads through the entire

* We take this opportunity of expressing our deep regret at the accident by which the late Mr. C. Blachford Mansfield met with his lamentable death. Engaged, as was his wont, in the pursuits of experimental science, he accidentally spilt upon his garments an inflammable fluid, which ignited and burnt for some time unassuaged. He at last succeeded in plunging into the canal near to his laboratory, but not until he had sustained injuries which, after a few days, unhappily proved fatal. In him we have lost a man of great virtue, and of high scientific attainments.

lump of a man's character and conduct. Get men to believe that the pencil of the painter is steeped in the paltry colours of his own avarice and vanity, and they turn with disgust from his picture! But, happily, it is also true that, beneath the prurient surface of the common mind, there is a hidden but enduring spirit of justice and honour, which corrects momentary errors, and loathes nothing more than successes won by slanders.

The facts connected with the nomination of Mr. Babbage to the Secretaryship of the Royal Society are not only not as Mr. Sheepshanks describes, but are such as to render it impossible for any one to entertain the opinion that he seeks so skilfully to establish. The fact appears to be, that some eminent persons in the Royal Society, amongst them Mr. (now Sir J.) Herschel, were anxious that Mr. Babbage should fill the office of secretary, and, after obtaining his consent to accept the post, were induced to abandon their intention by a counter influence, of which, we believe, Sir H. Davy was the organ. The opposition to Mr. Babbage's appointment was of a character which, in our judgment, the gentlemen who had invited him to become a candidate ought to have effectually resisted, as they might have done; but, unhappily, men possessed of high scientific attainments are not always endowed with moral force enough to root out the corruption which is fostered in all great societies. We do not know that Mr. Babbage has ever made any secret of the fact that he did disapprove of the part taken by some on that occasion, nor do we think any sensible person will consider secresy necessary under such circumstances. Mr. Sheepshanks might naturally enough have held his peace, *and sought a subsequent nomination;* but there could be no reason why a man like Mr. Babbage, who would have carried honour to the office, and whose nomination certainly *did* "give *éclat* to Captain Sabine," should so demean himself. We say Mr. Babbage's nomination did give *éclat* to Capt. Sabine; it did, but it was when Capt. Sabine was nominated the year following the invitation given to Mr. Babbage. The two candidates were *not* competitors. We might enter into statements which would prove how little Mr. Babbage had to do with his own nomination to the office, and how justly he complained of having had his name and fame used as a convenience by Royal Society officers; but to do so falls scarcely within our province. We have said enough to show that the only "key" presented by Mr. Sheepshanks to the "Decline of Science," is one which admits us still further into the evil secrets and mysteries which Mr. Babbage might have refrained from revealing with great advantage to himself, but which he has, as much to his hurt as to his honour, made known and denounced. We are persuaded that the qualities of courage and integrity have made Mr. Babbage hateful to many to whom the opposites of these virtues would have endeared him.

There are other points somewhat analogous to the foregoing mooted in Mr. Sheepshanks' pamphlet, but we should weary our readers if we attempted to drag them through so dreary a series of personalities as they constitute. The Astronomer Royal gets dreadfully dosed with the praises of an individual from whom he appears unable to free himself. We do feel an unaffected pity for him. If anything we have said, or have to say, should prove a bitter cup to the author, none, we should think, will be more grateful to us than Mr. Airy. We know not whether a too zealous friend or an enemy be the greater affliction to a man, but we can scarcely imagine it possible for the powers of satire and malignity combined to harass an individual more than *a friend* who *will* praise you without stint—in season and out of season; especially if you are a public man!

The Calculating and Analytical Machines of Mr. Babbage afford the occasion of the *third* portion of Mr. Sheepshanks' strictures upon Mr. Babbage. He says, "I have always condemned Mr. Babbage's conduct in not giving a satisfactory account of 'the Calculating Machine,' and the reasons of its failure, but without pretending to judge of the machine itself, about which I never felt any interest." The machines are also spoken of slightingly on the last page of the pamphlet, although the author is induced to add, "If my friends had treated me Proteus fashion, and applied thumbscrews, I should have advised that the *Calculating Machine* should be finished under Mr. Babbage's direction (with, perhaps, some little control over the purse),* and that the second, or *Analytical Machine*, should be postponed till the completion of the former. Although the machine might have been of little value for actual calculation, it would have been something to have had a piece of machinery which would calculate. The country would have been better satisfied, I think, and we should at least have had a clever toy for our money. It is very likely that some of the contrivances would have found useful applications elsewhere, and that the novelties would have fructified in other brains. The possibility of these in-

* Mr. Sheepshanks, on page 64, in reference to Mr. Babbage's intercourse with the Government on the engines, says, "I need not say that I have always scouted any charge of pecuniary dishonesty."

direct advantages should always reckon for something when new schemes are propounded. I have understood that, in the hands of Mr. Clement, the construction of the *Calculating Machine* formed a school of better workmanship than had hitherto existed. If it tended to develop the talents of Mr. Joseph Whitworth, the cost has been amply repaid."

As a final answer to all that Mr. Sheepshanks has said, or may yet say, upon this subject, we will give an extract from the "Address of the Right Honourable the Earl of Rosse, &c., &c., &c., the President, delivered at the Anniversary Meeting of the Royal Society, on Thursday, November 30, 1854"* To do this will save us trouble, and be the most effectual answer that can be presented.

"You are all, gentlemen, no doubt aware that in 1823 your council, at the request of the Lords of the Treasury, appointed a committee to report upon Mr. Babbage's plan for the construction of a calculating machine, which he called a difference-engine. The committee, I need hardly say, was composed of men eminent for their theoretical and practical acquaintance with such subjects: that committee recommended the Lords of the Treasury to assist Mr. Babbage in carrying out his undertaking. The Lords of the Treasury acquiesced, and the work was proceeded with, Mr. Babbage exercising a constant and vigilant superintendence, furnishing the designs, making the computations, in fact supplying all the theoretical requirements, while the Government supplied the manual labour and raw materials. In the then backward state of mechanical engineering, great difficulties were encountered; at length, in 1828, the Royal Society was again consulted by Government, and the result was a report from a committee to the effect that satisfactory progress had been made, considering the difficulties, and that the engine was likely to answer the expectations of its inventor. The council adopted the report, and communicated it to Government, with a strong recommendation in favour of the undertaking. The Government acting under that recommendation supplied further funds, on the condition that the engine was to be public property, and the work proceeded. In 1830, the Royal Society was again consulted by Government; and the council, acting as on former occasions, appointed a committee. The report, which was drawn up in a detailed form, was satisfactory to the Treasury, and the council were informed that funds would be supplied from time to time till the engine was completed. Very soon a new difficulty occurred; it became necessary to change the engineer, and it was then found that by the rules of the trade, the tools which had been constructed at the public expense, were the private property of the engineer: there was no choice, therefore but to sacrifice the tools, or to endeavour to effect a compromise for a large sum. The progress of the work was suspended: there was a change of government. Science was weighed against gold by a new standard, and it was resolved to proceed no further. No enterprise could have had its beginning under more auspicious circumstances: the Government had taken the initiative; they had called for advice, and the adviser was the highest scientific authority in this country—your council, guided by such men as Davy, Wollaston, and Herschel. By your council the undertaking was inaugurated; by your council it was watched over in its progress. *That the first great effort to employ the powers of calculating mechanism, in aid of the human intellect, should have been suffered in this great country to expire fruitless, because there was no tangible evidence of immediate profit as a British subject, I deeply regret, and, as a Fellow, my regret is accompanied with feelings of bitter disappointment.* Where a question has once been disposed of, succeeding governments rarely re-open it; still I thought I should not be doing my duty if I did not take some opportunity of bringing the facts once more before government. Circumstances had changed, mechanical engineering had made much progress, the tools required and trained workmen were to be found in the workshops of the leading mechanists, the founder's art was so advanced that casting had been substituted for cutting in making the change wheels, even of screw-cutting engines, and therefore it was very probable that persons would be found willing to undertake to complete the difference engine for a specific sum.

"That finished, the question would then have arisen, how far it was advisable to endeavour, by the same means, to turn to account the great labour which had been expended under the guidance of inventive powers the most original, controlled by mathematics of a very high order, and which had been wholly devoted for so many years to the great task of carrying the powers of calculating machinery to its utmost limits? *Before I took any step*, I wrote to several very eminent men of science inquiring whether in their opinion any great scientific object would be gained, if Mr. Babbage's views, as explained in Ménabrèa's little essay, were completely realized? The an-

* London: Printed by Taylor and Francis, Red Lion-court, Fleet-street.

swers I received were strongly in the affirmative. *As it was necessary the subject should be laid before Government in a form as practical as possible, I wrote to one of our most eminent mechanical engineers to inquire whether I should be safe in stating to Government that the expense of the calculating engine had been more than repaid in the improvements in mechanism directly referable to it? he replied, 'Unquestionably.'* Fortified by these opinions, I submitted this proposition to Government:—That they should call upon the President of the Society of Civil Engineers to report whether it would be practicable to make a contract for the completion of Mr. Babbage's difference engine, and if so, for what sum. This was in 1852, during the short administration of Lord Derby, and it led to no result. The time was unfortunate, a great political contest was impending, and before there was a lull in politics, so that the voice of science could be heard, Lord Derby's government was at an end.

"Although, in communicating with Lord Derby, I was not acting under the directions of your Council, still, as my object was to induce the government to complete a work in which this society had taken so great an interest, I conceived it to be my duty to lay the facts before you, as a basis to proceed upon, should it hereafter be considered expedient to renew the subject."

The above remarks convey an answer not only to the enemies of Mr. Babbage, but also to much that has been said about the evil prejudices created by the grants of the government for the construction of his machines—to this from Mr. Sheepshanks letter for instance: "I have felt this want of explanation" (on the part of Mr. Babbage), "and I think others have felt it too, a 'lion in the path' when any application for public money was suggested;" for it now appears "that the expense of the calculating engine had been more than repaid in the improvements in mechanism directly referable to it"! So that really those gentlemen who have done their best to damage Mr. Babbage's inventions with the government have summoned up an imaginary "lion in the path," and impeded the exercise of those fostering functions which the government should always be ready to employ for the genuine progress of the arts and sciences. The vindication of Lord Rosse is surely sufficient to sink the insinuations of a score of such individuals as Mr. Sheepshanks.

Finally: The only charge that gentleman has to bring against our predecessor is, that he published articles in favour of Mr. Babbage and Mr. Adams, Sir James South's letter, and the letter of *Exoniensis* on the discovery of the planet Neptune. As a specimen of the manner in which his complaints are expressed we quote the following: "I fancy the Editor felt nettled by my remark, and, *with the meanness of persons of his kidney*, has lent himself to the calumnies of Mr. Babbage and South, though he might have seen that they were probably untrue." We will not reply to so sensible and moderate an attack as that!

The remark above referred to by Mr. Sheepshanks was, that he considered the letter of "Exoniensis" so ridiculous, that he supposed it was a hoax. And yet the only explanation of the Neptune question offered by him is given thus: "The whole difficulty arose from Mr. Adams's neglect in not replying to the letter in which Mr. Airy asked, whether the new planet would account for the irregularities in the radius vector as well as for those in the longitude of Uranus? Mr. Adams could have answered this query in five minutes, if he could have overcome the dislike he has to writing at all." Surely this is scarcely a sufficient reason for nearly handing over the honour of one of the greatest scientific feats of modern times into the hands of a Frenchman!

In his preface, Mr. Sheepshanks thinks "this journal, too, had its own inducement." Well, all we can say to that is, that Mr. Sheepshanks is at liberty to think so — it is natural *he* should. We think otherwise, and so will most persons who love other objects more than scandal, and other Gods more than Mammon.

If Mr. Sheepshanks is annoyed with what we have written, he will nevertheless have to thank us for our lenience. Let him try to learn a little wisdom even now, and, for the future, distinguish between things that are antagonistic. He would do well also to remember that genuine virtue is of more worth than spurious wit—that innocence is better than apologies for crime—and that paltry partizanship is opposed to the wise command, "Render to all their dues."

NOTÆ MATHEMATICÆ.

(By T. T. Wilkinson, F.R.A.S., Member of the Manchester Literary and Philosophical Society; of the Historical Society of Lancashire, &c.)

NO. VI.

(Continued from p. 582, vol. lxi.)

Since the death of Professor Davies, in January, 1851, several of those who either enjoyed his personal acquaintance, or were favoured with his correspondence, have en-

deavoured to do justice to his abilities as a mathematician, and to his character as a man. Immediately after his decease, Professor Young paid a fitting tribute to his memory, in No. 1431 of this Journal; and some time afterwards, Dr. John Cockle commenced, and his brother, James Cockle, Esq., M.A., completed, a "Biographical Memoir" of the "Great Geometer," in Nos. 18 and 51 of the *Expositor*. About the same period, I drew up a short account of his writings, for the editor of the *Architect and Civil Engineer*, which appeared in No. 166 of that serial, and was afterwards reprinted, with some alterations, in No. 42 of the *Educational Times*. Finally, in the *Westminster Review*, for April, 1851, I entered into still further details respecting the nature and extent of his writings, and pointed out some of their many relations to "English Mathematical Literature." Since that time there have not been wanting numerous instances in which the labours of Professor Davies have been spoken of with much respect. M. Chasles, in his *Géométrie Supérieure*, styles him "*le savant professeur*," when referring to the contents of the second volume of his edition of Hutton's "Course," and in the *Philosophical Magazine*, and elsewhere, we may find ample proofs of his having made himself *felt* in many departments of pure and applied mathematics. Geometry, however, was his *forte*; to its systematic treatment he directed his best energies, on many occasions, with considerable success; nor can the geometrical student fail to profit largely by what he has effected in its application to various interesting inquiries, but more especially to porisms and the modern geometry. As yet his personal characteristics remain a desideratum. But little is known, beyond the immediate circles of his associates, respecting the late Professor as he appeared in his private capacity; and hence no apology is requisite for occupying one of these notes with the following supplementary sketch, by one of his most intimate friends. It will be seen from the dates that the manuscript has been completed for a considerable period, and I may add that I feel honoured by having been permitted by its author to lay it before the readers of this Journal in its *original* form:

"THE LATE PROFESSOR DAVIES.

["The following supplementary memoir of PROFESSOR DAVIES is intended by its author as an addendum to that from which an extract was published at pages 432, 433 of vol. lv. of the *Mechanics' Magazine*.

"JAMES COCKLE, M.A.,
"Barrister-at-Law.

"2, Pump-court, Temple,
"18th June, 1852."]

"The portion of the extract above mentioned, which owes authorship to me, commences with the beginning of the last paragraph but two of the right-hand column of page 432. I have given, in a foot-note, corrections of some errors which occur in it.* Omissions of, I fear, a graver kind, I shall here endeavour to supply.

There is inherent in most minds a desire to realize to the imagination the features and personal peculiarities of those with the works of whose genius we are acquainted. A portrait of Professor Davies appeared in No. 18 of the *Expositor*; and notwithstanding the refractions, if I may use the expression, which the likeness has sustained in being transmitted from the living features to the canvas, from the canvas to the drawing, and from the drawing to the engraving, a good general idea of his countenance may be formed from it. Considering with how many kindred intellects, in so many departments of knowledge, that of Davies held intercourse, it may be thought interesting if I add a few of the traits and social characteristics of that estimable man.

He was of a spare build, and rather short in stature. His face, not very long, was broad at its upper and sharp in its lower portion. A forehead ample, but not remarkably lofty; eyes blue or grey; a complexion pale and somewhat sallow; hair dark, but slightly changed by time; a halting gait, the result of an early injury to one of his feet; a pronunciation slow and measured, contrasting strangely with the readiness and facility of his written composition;—such, when I first knew him, were his bodily characteristics. His mental vivacity and sprightliness, and a certain lurking humour, rendered him a charming companion, and suited a temperament by no means unconvivial. Like many other persons of great intellectual activity, he also indulged in a somewhat excessive use of snuff.

This is a sufficiently minute personal outline of the great geometer, whose loss has called forth expressions of deep regret, not only from various mathematicians who have honoured me with their correspondence, but from such other quarters as sufficiently attest that it is a public loss which has been sustained in his death. I shall now pass on to his scientific character, and regard him as historian, logician, analyst, and geometer.

It must not be imagined that his observations respecting the *non-academic* school of mathematicians indicated personal hostility to any one connected with the govern-

* In line 8 of the paragraph mentioned in the text *for* "be" *read* "by;" in line 4 of col. 2 of p. 433, *for* "alike" *read* "like his;" in line 14 of the last-mentioned column *for* "prisms" *read* "porisms." Where requisite the original memoir in the *Expositor* should be corrected accordingly.

ment of the Universities, or any serious objection to that course of study by which, in one of them at least, the most profound results of mathematical investigation are imparted to her pupils with a rapidity and precision probably unrivalled in any other educational institution in the world. His observations were made at a time when many of his friendships and sympathies centred in Cambridge, and when the cordial reception and generous appreciation of some of the brightest ornaments of that University had shown him that true greatness never wants homage there. And it redounds to his honour that even under these circumstances, and at a time when Chasles in France, Sir W. R. Hamilton and Salmon in Ireland, and the scientific world in general had recognised his claims to distinction, he felt a pride in that self-taught class from which he sprang, on which his fame reflected lustre, and to whose ardent and persevering, and often vigorous and successful efforts, English science, particularly the geometrical branch, owes so much. The mention of DAVIES will always attract attention to, and excite respect and sympathy for, that meritorious body of men. It is gratifying, too, to think how often the sacred fire of mathematical science warms and ennobles the exertions of labour, and enlightens the gloom of obscurity.

He spoke of course of the existing state of the scientific world; not in disparagement of a University, for which he felt (as he has publicly expressed) a deep sentiment of respect. Even although in his opinion there were blots upon her constitution which were calculated to give rise to prejudicial effects, science will have gained if such an opinion excited his emulation; and if that spirit formed any ingredient in his exertions it must have been not a little gratified at the tributes of respect for his learning simultaneously paid him by Sir W. R. Hamilton and Professor De Morgan, in the *Philosophical Magazine* for September, 1849; tributes as honourable to themselves as they must have been grateful to him. But let us proceed.

An acquaintance with the history of a subject is as useful as it is interesting to him who enters upon it. An honourable mention is no more than is justly due to the investigator whose labours have enlarged its range, or possibly brought it first within the sphere of knowledge. No man ever afforded in his own person a brighter illustration of the value of such knowledge, or set a more splendid example of assiduity and success in the pursuit of it. And, let me add, that so far as others are concerned, none ever employed his acquirements with more ungrudging candour. He can neither be charged with the unfairness which would suppress all mention of another investigator, nor with the negligence which would omit it. But his qualities were not merely negative. He possessed one far higher than the absence of these defects. An anxious desire to give to each his just tribute of acknowledgment not only actuated his mind, but it also regulated his conduct. His writings bear ample witness to this wise and generous spirit of appreciation. There can be as little doubt of the policy as of the justice of the course which he adopted; but it is one which I may say, without attributing unworthy motives or carelessness to those who deviate from it, is unhappily not always followed. Exigencies having another source than that sole true one, the requirements of the subject, have contributed to this divergence. But a compliance with them, however excusable in some branches of literature, will scarcely find a ready pardon from the cultivators of mathematical learning. Impolitic fiscal regulations; prescribed limits to be observed; speedy and extensive circulation to be attained; temporary purposes to be achieved, will in such cases hardly be admitted as a palliation. Undue compression; a dry and barren derivation of strings of formulæ; an avoidance of the history of a subject and of all notice of its investigators can, except in certain distinguishable cases, be only justified by the most pressing necessity. Interest would be thrown over arid tracts of knowledge by the mention of those who have traversed them, the purposes which they had in view, and the ends which they attained. And the brighter ones would be rendered more glowing still. It is deplorable that at the entrance of these rugged and, as they must often appear to the stranger, unalluring and lifeless sciences, they should be deprived of that reference to the past and present; that spirit of history which would warm and vivify them. At present, with so many noble examples of an opposite character, such a manner of dealing with the subject must be strongly reprehended. Probably none would hesitate to blame the author who intentionally proffers as his own the result of the efforts of another. A milder, though still a severe, censure ought to await him whose indolence makes him neglect to ascertain, or whose ill-judged desire of condensation induces him to suppress the historical and collateral details of which I have spoken.

I have elsewhere alluded to the care with which he avoided any possible infringement upon the discoveries or rights of Horner, whose papers once confided to him, were before his death transferred to Mr. De Morgan. In other fields where his vigor-

ous intellect could allow itself to play unfettered by scrupulous self-restraint and high-souled delicacy, he displayed consummate analytical skill. I have not now a fitting opportunity to do more than hint at my view of the subject, but I much question whether his clear conception of the division of Propositions into Theorems, Problems, and Porisms, will not be found as useful in Analysis as in Geometry. His views were for the most part taken in reference to a geometrical purpose, but not entirely so, as will be seen on inspection of his paper on the Algebraical Analysis of Porisms in the opening number of a work which he once assisted in conducting—the *Mathematician*.

He took a keen interest in many questions not directly bearing upon the mathematical sciences, and in which the influence of his advocacy is in all probability still felt. Without attempting now to follow him through his labours, or to lift the veil which obscures some of his efforts, I must repeat that, high as may be the estimate which we form of him judging from his mathematical genius, they would have a very imperfect notion of his mental powers who judged him by that standard alone.

Professor Davies, as is well known, left some memoirs incomplete and some in progress. The incompleteness above alluded to is an obvious source of regret; and not less so is the loss of those topics of profound and recondite inquiry, some of them more or less distinctly alluded to in print, which floated over his mind and ever occupied its active laboratory. But to indulge in speculations on the extent to which science has suffered by the death of Professor Davies, although perhaps not a difficult task to those familiar with the workings of his capacious intellect, is one which could terminate only in disappointment and vexation. Let us, however, hope that among his papers will be found the means of repairing a considerable portion of the loss.

It must not be thought that a search among those papers has been altogether neglected. At the request of Mrs. Davies an inspection was made of a portion of them, by Professor J. R. Young, late of Belfast, and myself conjointly, on or very shortly before Saturday, the 26th of June last, at the former residence of our late friend. Our examination, however, was not very successful. Its principal result was the destruction of a part of them, which, in our united judgment, it was useless and unnecessary to preserve. The mere manual labours of Davies in actual writing appear to have been extraordinary. His industry does not seem to have shrunk from the task of copying somewhat voluminous printed books and papers. It may be satisfactory if I state that the papers which Professor Young and I have examined, constitute far from the more considerable portion of the literary remains of Davies, and that I hope ere long to prosecute a further search in conjunction with my friend, as soon as that distinguished mathematician's leisure and my own opportunities shall permit. I still entertain a sanguine hope that we shall discover the means of continuing or completing some, at least, of the departed philosopher's scientific undertakings.

JAMES COCKLE.

2, Pump-court, Temple, Aug. 26, 1852.

I need add little to what is here so well expressed by Mr. Cockle. All who have examined the writings of the subject of the Memoir will agree that the encomiums are well deserved, and that Professor Davies has fairly merited the good opinion of all mathematicians, whether non-academic or otherwise. His practice of referring to the writings of those who had previously entered upon any subject of inquiry, does not appear to have met with the approbation of some of his contemporaries. The result of his historical researches had the effect of depriving several of a portion of their temporary honour; and hence, as he expresses himself in a letter to me, bearing date September 29th, 1849, he had occasion "to remember well the ridicule with which my adherence to the principle of quoting authorities of every kind, 'on all legitimate occasions,' was treated years ago. It was represented as intended to parade my reading, and even as morbid sentimentality. Sly sarcasms met me at every turn, intended to give me pain, but not open enough to be directly taken as offensive. Nevertheless, I have, on all proper occasions, expressed my condemnation of the practice of appropriation without acknowledgment, and shall always continue to do so. I think, too, I have effectually exposed some of the more glaring instances of comparatively recent times. I was indeed glad, therefore, to see your remarks on the same subject at page 295, col. 2, of the current volume of the *Mechanics' Magazine*." Since the period here alluded to, the practice of citing authorities has gradually extended itself, and many of our leading authors do not now consider their reputation liable to be damaged by indicating the labours of those who have traversed the same regions of science before them. Many honourable examples of rendering "honour to whom honour is due" have already been given by several of the leading men at the "fountain head" of mathematical learning in this country; and after such examples he must

be hardened indeed to all sense of shame, who will hereafter appropriate the labours of others and endeavour to palm them upon the world as the results of his own legitimate investigations.

(*To be continued.*)

ON STEAM AND SAILING COLLIERS.

The discussion following Mr. Allen's paper on the above subject* was continued at the Institution of Civil Engineers, on the evening of Tuesday, March 13. Details were given of the construction, &c., of the *Arthur Gordon*, the *Iron Age*, the *Anne*, and the *Augusta Louise*, vessels constructed for carrying iron ore, a cargo of great specific gravity; fore and aft-tanks were used in these ships in conjunction with bag-ballast, and the results obtained induced the conviction, that the tank-ballast would soon be superseded by either bottom-ballast or hold-ballast; that it was disadvantageous to build vessels exclusively for one class of cargo, as tempting offers of charter, in emergencies, could not be accepted, and that bag-ballast possessed certain advantages in being applicable to either wood, or iron vessels, whether sailing, or steaming, and that when the duration of the bags was increased, by improvements in manufacturing the material, the system would doubtless be more generally employed.

It was contended, that a system of construction applicable to the iron-ore trade would not be adapted for screw colliers, and that tanks were more expensive than either hold-ballast, or the double bottom. The chief disadvantage of the hold-ballast was its causing "breaks" in the cargo; which were objectionable, inasmuch as every time a shoot of coal was commenced, there occurred additional breakage in the coal from its falling a greater depth in loading. It was better to shoot the entire cargo by one hatchway, as the coal soon formed an incline for itself, and less breakage occurred.

On behalf of sailing colliers it was urged, that the capabilities of the steam colliers had been overstated, and the number of voyages which sailing colliers were capable of making, were understated. There were no valid reasons why small engines should not be used for unloading sailing colliers, and if the system of long detention in the Thames was abolished, they might do fifty per cent. more work than at present. Then, if one screw collier cost as much as six sailing colliers, and with all the advantages it possessed, the former only made three times the number of voyages of the latter, all improvements of system would tend to reduce this difference of result, and it was still uncertain what amount of wear and tear there really was in screw colliers, during a series of years. If this proved to be very considerable, the alleged advantages of this newly introduced class of vessels would be seriously diminished. It was shown, the *Hunwick*, screw vessel, which had been mentioned in the paper, was found, after running four years as a collier, to have worked with such small advantages as to induce her being devoted to other purposes. The necessity for the formation of the larger and more commodious collier docks, in the North, and in the Thames, as well as harbours on the East coast, was forcibly represented; unless this was done, there would, at some period, occur a more frightful list of casualties, among this new class of screw steamers, than had ever been experienced by the old sailing ships.

It was argued, that the system of rotation in discharging in the Pool, and the frequent long detention there, unduly enhanced the expenses of the sailing colliers, and, combined with the irregularity of supply, caused by the prevalence of certain winds, induced the fluctuations of price on the coal exchange. The only effectual remedy for this was a powerful fleet of screw colliers, constantly and punctually running, with commodious havens at each end, like the Victoria Docks, now in course of construction; with every means of facilitating the rapid discharge of the cargoes into the trucks, to be conveyed by the railways to the various depots. This alone could insure a constant supply of coal, at a uniform price, in the London market, and this could only be accomplished by screw colliers. At present, there were frequently vast numbers of sailing colliers, detained in the Tyne by adverse winds, or by want of water on the bar; on a change of weather they all got away, and a cloud of them arrived at the mouth of the Thames, up which river they had to beat for upwards of 100 miles, against a contrary wind, and on their arrival caused a glut in the market instead of merely supplying the regular demand; whereas the screw colliers made their passages regularly, and the only disadvantages they had to contend with, were those incidental to the navigation of long ships with deep keels, up a tortuous and crowded river. It was well known, that in the past year, during the prevalence of adverse winds, the total extinction of the gas lights of the Metropolis had only been prevented by the punctuality and rapidity of the screw colliers. That class of vessels had, in reality, scarcely yet been introduced into the regular coal trade, inasmuch as the services of the few screw vessels yet built,

* See last Number, page 250.

had been secured for the gas companies and the railways.

The details were given of the working expenses of a sailing collier brig of 227 tons register, which had made, in the last year, nine voyages from the north to London, delivering on an average 335 tons per voyage, at 9*s.* 4½*d.* per ton freight. The gross receipts were £1,416 3*s.* 1*d.*, and the expenditure £1,149 13*s.* 1*d.*, leaving a nett profit of £266 10*s.* = 18¾ per cent. upon the receipts, or 26¼ per cent, on the original capital. The brig was twelve years old, and had cost £1,000.

It was contended that the wear and tear of the screw colliers should be estimated upon the duty performed, rather than upon the number of years duration; and that sufficient time had not elapsed to enable experience to be acquired of the actual amount of depreciation of screw colliers in constant use during all seasons. Their rate of profit must evidently depend not only on the fitness of their original construction, but on the system of working them. Screw vessels had been put into the coal trade, for which they had not been originally intended, and to which it was scarcely possible to adapt them advantageously; although with a miscellaneous cargo, or with passengers, they might have done well. It appeared that peculiar lines, and certain capabilities, were indispensable to good screw colliers; and the knowledge of what these points of excellence were could only be attained by long experience. Maximum capacity for cargo, at only a given cost,—light draught of water, to suit the harbours, bars, and rivers,—stability, both loaded and light,—given limits of length, breadth, and depth must not be exceeded,—strength to permit grounding without injury to hull or machinery, and requiring a minimum quantity of ballast, were the chief considerations in the construction of screw colliers; and experience had already demonstrated, by several failures, how difficult of attainment these qualities really were.

As to the various systems of ballasting, the bag-ballast was generally approved for its convenience, and the only serious objection to it was its comparative want of durability. Bottom-ballast was objectionable, on account of the non-accessibility, in original construction, for painting and for repairs, unless the floor space was very deep. Tank-ballast occupied so much useful space as to reduce the bulk of the cargo, and thus diminish the amount of the freight; therefore it was that the hold-ballast had been introduced, and hitherto it had proved very serviceable. The space was available for cargo, the water was easily introduced and discharged, and the weight was so high up as to make the vessel very easy and weatherly when in ballast. For these practical reasons, as well as on account of the comparative smallness of the cost, hold-ballast was contended to be the best system.

It was stated, in allusion to certain tables given in the paper, that the quantity of coals now raised in Great Britain was about 50,000,000 tons per annum.

THE ARGAND FURNACE.

To the Editor of the Mechanics' Magazine.

SIR,—Being a constant reader of your Magazine, I am rather surprised to find so long a discussion as to the invention of the *name* of the Argand furnace, and none as to the invention of the Argand furnace itself. Mr. Williams has so perseveringly claimed, as his own exclusive and original invention, the introduction of air in numerous jets, and the diffusion of it amongst the gases in the furnace, that almost every one, including Mr. Baddeley, appears to consider that he really was the first inventor of this subdivision of the air. The subdivision and diffusion of the air is, however, fully described in the specification of the patent of James Gilbertson, granted January 15, 1828, eleven years before Mr. Williams's patent. I called your attention to this patent in a former communication,* and I now send you a copy of the specification and drawings, as published in the *Repertory of Patent Inventions*, vol. 7, 3rd series, p. 65. I think you would do good service to the public by printing this specification.

I am, Sir, yours, &c.,

C.

March 12, 1855.

[Considering the somewhat incidental manner in which the introduction of streams of air to the furnace is mentioned in the following specification, and observing that the air is to be diffused freely "among the *smoke*," we do not think the claims of Mr. Williams to public consideration will be at all diminished by what Mr. Gilbertson had previously done. It is true that the latter divided the air on its admission to the "smoke"—but that is all. He does not even shadow forth any of those scientific arguments by which Mr. Williams has shown the true effects and merits of the arrangement. It appears to us that the use of the grating was primarily for the protection of the air-chamber from fuel which would otherwise have fallen into it, and not

* Page 15, current volume.

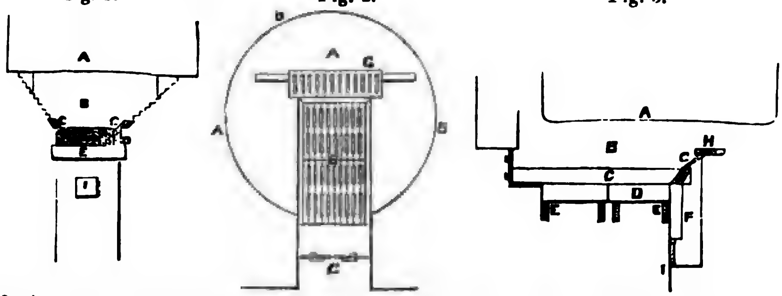
for the division of the air into streams. This opinion is confirmed by the fact, that in a paper of "Observations," published in the *Repertory* at the time by the patentee, at the end of his specification, though several "advantages" are enumerated, no mention is made of the distributive action of the grating. We think it right, however, that the suggestion of our correspondent, "C." should be followed, and we accordingly subjoin Mr. Gilbertson's specification.—ED. *M. M.*]

"My said invention consists in the construction of furnaces with the sides of them made of hollow plates of iron, in order that a current of air may pass through them and in its course become heated, and then be discharged into a cavity or ash-pit formed at the back of the fire, whence, proceeding through a grating affixed at the top of this cavity, it comes in contact with the smoke and flame of the fire, and causes an almost complete combustion of the whole of the fuel employed.

"In large furnaces, where a great quantity of air is necessary, I make a portion of the whole of the bars hollow, but I do not claim any invention in this application of hollow bars, only, as in aid of the effect to be produced by the hollow plates at the sides.

"The accompanying drawings in the

Fig. 1. Fig. 2. Fig. 3.



margin of these presents, and the following description thereof, will more particularly ascertain and determine the precise nature of my invention (that is to say): Fig. 1 is a section of a furnace constructed according to my improvement or improvements, from A to B in the plan. Fig. 2 and fig. 3 is another section from C to D. The same letters refer to the same parts in each figure. A the boiler, B the furnace; C the hollow side-plates; D the furnace bars; E the bearing bars; F the air cavity or ash-pit at the back of the furnace having a door, I, for the purpose of clearing out the dust and ashes that will accumulate; G the air-grating at the top of the air-cavity to prevent the fuel from falling into the air cavity, and to diffuse the heated air freely among the smoke of the fire; H an iron plate or other suitable material projecting a few inches over the grating, to direct the heated air from the cavity on to the fire of the furnace.

"*Note.*—I do not mean to confine myself to the precise form and construction of furnace exhibited in the drawings in the margin of these presents, as it is evident various modifications may be requisite to adapt my invention to different kinds and forms of furnaces."

REPLY TO "INDAGATOR" ON THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

SIR,—I regret to perceive, from the tone of "Indagator's" reply to me, that he has received my remarks in a spirit very different from that in which they were offered. I pointed out what appeared to me to be an erroneous statement, in terms as courteous and as little offensive as it was possible to use. I brought no charge of "ignorance," and was quite willing to attribute the error to a casual oversight, such as may happen to the best mathematicians, especially when writing in haste, and in a controversy of but trifling importance; much less did I indulge in such unwarranted insinuations as that in which "Indagator" charitably "hopes" that the errors which he pretends to have discovered in my letter *may* be nothing worse than the effects of "inadvertence." It is surely possible for even a first-rate mathematician to make mistakes, without any very serious damage to his reputation, even though these mistakes be pointed out by men inferior to himself. Newton himself made mistakes which were corrected by some of his cotemporaries of vastly inferior standing; and, instead of being vexed and angry, he candidly admitted his error, and profited by the criticism.

The case between "Indagator" and myself is briefly this:—He cited a general pro-

position respecting "principal axes being permanent axes of rotation," in a manner which I considered, and do still consider, to be inaccurate and improper. His words are the following:

"The moon has had impressed upon her a motion of rotation by which she revolves about one of her principal axes once in a lunation. *The earth's attraction exerts no force to interfere with this.*"

Now, taking this in connection with his previous reference to the above-named general theorem about principal axes, I believe that most mathematical readers will agree with me in saying that such a statement is either erroneous, or, at the least, calculated to convey an erroneous impression. As it stands, and without the explanation which "Indagator" now professes to give of the sense in which it is to be understood, I repeat that it is an erroneous statement; and even with this concession as to his meaning, it is decidedly calculated to mislead. "Indagator" *now* begs it to be understood that when he wrote the above, he meant it only to apply to the supposition of the moon's being a "*perfect homogeneous sphere.*" This alters the case completely. I understood him to say that, in the real case of the moon's present condition (of which we know nothing), the attraction of the earth can exert no force interfering with her motion of rotation round one of her principal axes: and I understood him to conclude this from the above-quoted property of principal axes—a conclusion which would be false, since that property is only *generally* true when no external forces are supposed to act. My interpretation of "Indagator's" meaning was also that put upon it by the friend to whom I alluded, and of whom I may perhaps be permitted to say, that he is one of the best mathematicians at Cambridge, and at least as good a judge of the present subject as "Indagator," whoever he may be.

The probability is, that the moon is not a "perfect homogeneous sphere;" and in that case, the earth's attraction must have a tendency to affect her rotation, similarly to the effect produced by the sun and moon on the earth's rotation. The consideration of the combined effects of the sun and earth on the moon, when she is supposed to be an *heterogeneous spheroid*, is a subject for that investigation which I proposed at the end of my letter.

I do not need to be told that a force passing through the centre of gravity of a body cannot alter the rotation round an axis passing through that point; and "Indagator" might have saved himself the trouble of such gratuitous elementary instruction in mechanics. But I am sorry to say that I think he stands in need of a little elementary instruction in logic and the accurate use of language. I "draw this conclusion" both from the ambiguous nature of that passage which has led to this controversy, and from the following sentences, in which my opponent has endeavoured to revenge himself by "drawing conclusions" from my words on which he founds a charge of ignorance on my part. The words of mine which he quotes are these:

"The attraction of the earth is an external force acting on the moon, and, *therefore*, the proposition respecting principal axes being permanent ones of rotation, does not apply in this case."

On this "Indagator" remarks that "this statement, as it stands, without limitation is erroneous;" and that "I seem labouring under the error that the mere fact that an external force acts on a body, places it necessarily and at once out of the sphere of the application of this principle."

"At least," says he, "I can draw no other conclusion from the words above quoted."

To this I answer, that this inability to draw any other conclusion, is a proof that he is not much accustomed to strict accuracy in the use of language. My statement, as above quoted, is *not* "erroneous," and "limitations" have nothing whatever to do with it. I do *not* suppose that "the mere fact of an external force acting on a body," will necessarily prevent "the principal axes from being permanent axes of rotation." I see, quite as clearly as "Indagator" himself, that if, for instance, the moon were a "perfect homogeneous sphere," and consequently the resultant earth's attraction passed through her centre, *then* the introduction of such external force would not disturb her rotation round an axis through that centre. But I say that, even in this case, the truth does not follow from the above-named general theorem, which APPLIES only to those cases where there are no external forces. "Indagator" does not distinguish between the truth of a certain proposition in a particular case (such case involving conditions not contemplated in the general proposition), and the *necessary* truth of the proposition as a particular case of the general theorem. If I may illustrate the matter in a popular way, I might use some such illustration as the following:—It is a general proposition that war produces more evil than good. Now it may happen, however, in a particular case, that a certain war does also produce more good than evil, *not from the general nature and effects of war*, but from peculiar circumstances. Although, therefore, the general proposition would be true in this particular case, it would be improper to cite it as the proposition *in virtue of which*, and *as a consequence of which*, the war in question was bad. This is but an

imperfect illustration of the impropriety committed by "Indagator;" but it may serve to show of what kind it is. When I say that a certain proposition "*does not apply*" to a particular case, I by no means assert that such proposition *is not true* in that case.

C=D may be a *particular case* of A=B, so as to be necessarily true if the latter be true; and in this case, I should say that A=B APPLIES to it. But it may also be true that C=D, although this equality *would not follow from* A=B; and here I should, therefore, deny that this latter proposition *applied* to the case.

But, in truth, "Indagator" has laid himself open to the criticism which has been offered by stating, as *absolutely* true, what (according to his subsequent explanation) he *intended* to be *relatively* true only, and as arguing on the hypothesis of the moon's being a perfect homogeneous sphere. Even granting him this, however, his language was still objectionable; and, to prevent his misleading others, I took the liberty of doing the same to him that he has done to Mr. Recordon.

Before concluding, I cannot refrain from quoting another sentence or two from "Indagator's" reply, just as a specimen of his loose and illogical way of writing. He says:

"How any person at all acquainted with the true principles of mechanical philosophy could impute to another the notion that any mechanical principle can prove anything with respect to the actual forces exerted in any particular case, I am at a loss to conceive." "Indagator" seems to labour under peculiar difficulties in "conceiving" and "drawing conclusions." Is it not just possible that a person "acquainted with the true principles of mechanical philosophy" may be arguing with "another" who is *not* acquainted with them? and to whom, therefore, any "notions" whatever may be safely "imputed," if he lays himself open to it. Not that, in the present dispute, I ever made any such imputation against my antagonist; to whom, however, I feel quite justified in imputing a want of accuracy, both in the use of language himself, and in his interpretation of mine.

Again; he tells me that I "should remember that, when mathematicians state that the principal axes of a body are permanent axes, they always imply" the necessary limitation. Upon my word, this is a short and easy way of settling controversies, or, rather, of avoiding them altogether. If we are to take it for granted that a writer understands his subject, although his statements are erroneous; that he knows all the necessary limitations to a proposition, although he states it without any such limitation; if, in short, we are to assume that every man is right, although his statements are wrong, "the end of controversy" is, indeed, near at hand. Perhaps, however, even in this free and easy system, it may be advisable occasionally to warn those readers who might not be quite familiar with this new system, lest they should take *wrong* notions from a *right* author. Until this new and liberal system comes into fashion, I shall take the liberty to point out "*erroneous statements*" and the absence of necessary "limitations" in the writings of others, and shall also feel perfectly ready to acknowledge any such in my own, without taking offence, if the criticisms are offered in the same spirit as that in which I ventured to correct the errors of "Indagator."

I am, Sir, yours, &c., A. H.

POTICHOMANIE.

To the Editor of the Mechanics' Magazine.

SIR,—Very various are the methods from time to time resorted to by Eve's fair daughters, for killing — their supposed enemy, but when rightly employed their best friend—time!

Potichomanie is the present fashion, and to such an extent is this mania now carried, that a London glass-cutter is compelled to seek in Birmingham the glass ware he requires, the usual London makers being so fully occupied with the production of Potichomanie articles as to be unable to attend to orders for anything else! Vases of all shapes and sizes, plates, candlesticks, &c., are carried off as fast as made, and the brittleness of the ware adds not a little to the demand.

Although this pretty art has just now found so many eager and enthusiastic admirers—and practisers—it is by no means a modern discovery, the following directions being given in the "Family Library, or Five Thousand Receipts in the Useful and Domestic Arts,"* the 14th edition of which was published in 1839:

"*To make glass jars look like china.*—After painting the figures, cut them out, so that none of the white of the paper remains, then take some thick gum-arabic water, pass it over all the figures, and place them on the glass to taste; let them stand to dry for twenty-four hours, then clean them well with a wet cloth betwixt the prints, and let them stand a few hours longer, lest the water should move any of the edges. Then take white wax and flake white ground very fine, and melt them together; with a japanning brush go over all the glass above the prints; done in this manner they will hold water. Or, boil isin-

* Page 796.

glass to a strong jelly, and mix it up with white lead ground fine, and lay it on in the same manner; or use nut-oil and flake white. For a blue ground, do it with white wax and prussian blue ground fine; for red, wax and vermilion, or carmine; for green, wax and verdigris; for a chocolate colour, wax and burnt umber."

The modifications of the process above referred to, may perhaps suggest others, to persons engaged upon such work, which, although at present confined principally to *ornamental*, seems applicable to many highly *useful* purposes.

I remain, Sir, yours, &c.,

WM. BADDELEY.

13, Angell-terrace, Islington,
March 20, 1855.

GAS *v.* SMOKE.

*To the Editor of the Mechanics' Magazine.**

SIR,—Your correspondent, Mr. Palmer, while recommending Pinnock's chemical catechism to your readers in support of the novel doctrine that smoke is combustible, would have done well had he quoted the passage or passages he has discovered giving currency to such theory.

If Mr. Palmer will take an earthenware retort, and a small glass globe receiver, with two necks, he may proceed to charge the retort with coal, and lute its tube into one neck of the receiver, inserting a small metal pipe through a perforated cork in the other neck. If he now heats the retort, a SMOKY LOOKING vapour will soon fill the glass receiver and pass out at the metal tube, where it may be lighted. And if over the flame a wide metal tube be suspended, as when a glass chimney is adapted to a gas lamp, a volume of SMOKY LOOKING vapour will escape from the top of this metal chimney. Query. Which of these two SMOKY LOOKING vapours is GAS, and which is SMOKE?

By answering my query, so that his reply shall be in strict accordance with the statements put forth in his present letter, he will offer a decisive blow to what he calls Mr. Williams's "pragmatical" writings, and reap that applause from every lover of science which his very original chemical views (if correct) well merit.

I am, Sir, yours, &c.,

T. B.

Strangways, Manchester, Feb. 27, 1855.

* The delay in the publication of this letter rests with the writer of it.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in obtaining motive power.* (A communication.) Patent dated August 26, 1854. (No. 1875.)

This invention, communicated to Mr. Brooman, consists in certain arrangements by which the inventor proposes to obtain motive power from the force of gravity, and from the combined forces of gravity and electro-magnetism.

FAIRBAIRN, PETER, of Leeds, York, machinist, and ROBERT DEMPSTER, of Bessbrook, near Newry, Armagh, Ireland, flax-mill manager. *Improvements in machinery for carding, drawing, and spinning tow and tow-waste.* Patent dated August 26, 1854. (No. 1877.)

Claim.—Combining in one machine the means of carding, drawing, and spinning, as described.

LEGRAS, AUGUSTE ANTOINE, mechanician, of Paris, France. *An improved apparatus for regulating the level or flow of liquids.* Patent dated August 28, 1854. (No. 1878.)

This invention mainly consists in the employment of a separate regulating vessel, from which the supply is cut off when the fluid attains a certain height within it.

CARR, THOMAS, of Liverpool, Lancaster, share-broker. *Improvements in steering apparatus.* Patent dated August 28, 1854. (No. 1879.)

The inventor describes an arrangement by which an eccentric, on receiving a revolving or oscillatory movement, transmits its action by a connecting-rod to the tiller, while, on the other hand, the rudder, when moved by waves, will have but little power to act through the connecting-rod upon the eccentric to cause it, and the steering-wheel connected with it, to revolve.

M'CONNELL, ROBERT, of Glasgow, Lanark, iron-founder. *Improvements in shutters for doors and windows.* Patent dated August 28, 1854. (No. 1880.)

"This invention consists," says the inventor, "in dividing the shutters horizontally into two parts, which are connected together by suspensory cords or chains passing over pulleys in such manner as to counterbalance each other. Suitable recesses are formed above and below the window, and when it is necessary to open the shutters, one portion is caused to descend into the recess beneath, the other one being by the same action raised to the recess at the top of the window."

KIRKHAM, JOHN, of Tonbridge-place, New-road, and THOMAS NESHAM KIRKHAM, of Edith-grove, West Brompton, Middlesex, engineers. *Improvements in the process of manufacturing and purifying gases for lighting and heating, and in apparatus to*

be employed therein. Patent dated August 28, 1854. (No. 1882.)

This invention mainly relates to the manufacture of gas from steam or water (which is decomposed by being brought into contact with ignited coke), and consists in the construction of suitable apparatus; and in the combination of gas obtained, as above, with a gas rich in carbon, for the purpose of imparting thereto the requisite illuminating properties.

Burch, George, of Waltham-cross, Cheshunt, Herts. *Improvements in the manufacture of pulp.* Patent dated August 28, 1854. (No. 1883.)

These improvements consist in converting wood into pulp, by cutting it into chips, and softening it by boiling and crushing until the fibres are separated.

Gray, John, of Strand-street, Liverpool. *Improvements in the mariner's compass.* Patent dated August 28, 1854. (No. 1884.)

The inventor connects the bottom of an inner vessel or bowl with that of an outer one by springs, and also connects the upper and inner rim of one with the outer rim of the other by vulcanized India-rubber or other springs, the inner vessel or bowl being kept in a central position by tangential screws, so as to counteract the lateral action, whilst the springs below regulate the vertical position of the inner bowl in conjunction with a fluid contained in the outer bowl.

Hancock, James Lamb, of Milford-haven, Pembrokeshire. *Improvements in machinery for draining land.* Patent dated August 29, 1854. (No. 1886.)

The inventor forms a drain by means of a coulter attached to a wire rope and mounted upon a carriage. When this drain is made the plough is removed from the wire rope, and a "mole" or "cone," of the diameter of the required drain, is hooked to either end of the latter, and to the other end of the "mole" or "cone" a rope is attached by a hook or other means, on which rope the tiles are threaded, and by which they are laid continuously.

Gray, John, of Dublin, M.D. *A self-acting flushing apparatus, which may be arranged for registering the quantity of water or other liquid flowing through it.* Patent dated August 29, 1854. (No. 1888.)

The apparatus described by the inventor comprises an outer chamber or reservoir, an inner float chamber, a buoyant float which can rise and sink in the float-chamber, a valve of peculiar construction for closing the opening in the cistern, ordinary valves, &c., for the admission and discharge of liquid, an arm or rod for connecting the float with the valve, and suitable guide-rods.

M'Nally, Thomas, of William-street, Blackfriars, London, carpenter and builder. *Improvements applicable to window sashes or shutters.* Patent dated August 29, 1854. (No. 1889).

Claims.—Connecting the suspending cords of window sashes to the sashes by means of a swivel-joint which will admit of the sash being turned over by means of rack-work, so that the outside may be cleaned when required. Also the use and application of a moveable parting bead, which will admit of the sashes being taken out of the frames with facility.

Langlois, Louis Napoleon, gentleman, and Jean Baptiste Clavieres, mechanical engineer, both of Paris, France. *A new mode of constructing steam boilers.* Patent dated August 29, 1854. (No. 1890.)

This invention consists—1. In a certain mode of employing vertical and horizontal tubes, and of stopping and setting up the same. 2. In the use of a certain cement for forming steam-tight joints for the tubes. Ten parts of this cement are composed of three of powdered amianthus, three of pulverized porcelain earth, two of iron filings, and two of white lead.

Seithen, John, of Wakefield-street, Brunswick-square. *Improvements in the manufacture of cases or envelopes for covering bottles.* Patent dated August 29, 1854. (No. 1892.)

This invention consists in an arrangement of apparatus by which lengths of rush, straw, or other suitable material, may be readily tied together so as to form covers for protecting bottles when packed.

Williams, John Fisher, of Artillery-place West, Bunhill-row. *Improvements in joining cast-iron tubes.* Patent dated August 29, 1854. (No. 1893.)

In carrying out this invention the ends of the pipes are by preference cast so as to be capable of entering into each other, thus forming a socket joint, the socket end being formed with an abutment surface at an angle, and having a kind of recess into which asphalted felt or other packing is compressed by the end of the adjoining pipe which enters into the socket, and is drawn in by means of screws passing through external lugs or otherwise.

Campion, William, of Nottingham. *Improvements in the manufacture of warp fabrics.* Patent dated August 30, 1854. (No. 1896.)

This invention, which relates to warp machinery in which two needles are employed, consists in causing the guide-bars to work or lap their warp threads, so as to form the loops over the same set of needles in succession; the other set of needles, carried by a machine needle-bar, being so worked as to take or form their loops from the warp

threads previously laid over the first set of needles.

SYMINGTON, WILLIAM, of King William-street, London. *Improvements in apparatus for heating air by means of steam.* Patent dated August 30, 1854. (No. 1901.)

The inventor employs two hollow chambers connected together by numerous tubes (by preference of welded or gas iron tubing) fastened with nuts and screws and made steam proof.

DUNLOP, JOHN MACMILLAN, of Manchester, Lancaster, engineer. *Improvements in machinery or apparatus for preparing, cleaning, and cutting India-rubber and gutta percha.* (Partly a communication.) Patent dated August 31, 1854. (No. 1908.)

These improvements consist in the employment of rotatory and fixed knives between which the material is caused to pass, after the manner of rag cutting machines used by paper makers.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Certain improvements in apparatus for retarding and stopping railway-carriages.* (A communication.) Patent dated September 1, 1854. (No. 1911.)

In carrying out this invention a metallic ring is fixed upon each of the axles of the carriage, and an open circular spring or collar of a larger diameter than the ring is placed over it. The free ends of the spring or collar are fixed to a lever, which causes them to approach or recede, and act upon the axle.

DANKS, JAMES, of Birmingham, Warwick, glass cutter. *An improvement or improvements in inkstands, which improvement or improvements may also be applied to the stoppers of bottles, the packing of pistons, and other like purposes.* Patent dated September 1, 1854. (No. 1914.)

This invention consists in the use of a ring or rings of vulcanized caoutchouc or other elastic substance fixed in a groove or grooves on the funnels of inkstands and label dampers, stoppers, pistons, or other such articles.

WORTHINGTON, JOSEPH, of Manchester. *Improvements in counters or fittings of shops, warehouses, and offices, for arranging, preserving and exhibiting articles therein.* Patent dated September 2, 1854. (No. 1915.)

This invention consists in the employment of a series of shelves or trays, so arranged as to present a number of surfaces in a comparatively small cubical form, thus offering an extensive exhibiting surface in a small compass.

LEWIS, GEORGE, of High Cross-street, St. Martin's, Leicester, lock maker. *Improvements in the construction of locks.* Patent dated September 2, 1854. (No. 1917.)

The inventor claims two knife-edged stumps firmly riveted or screwed to the lock-bolt, and passing on each side of the lever or levers when in the act of locking or unlocking—a slot hole cut in the levers or tumblers for the purpose of sliding back on a fast stump at the opposite end, riveted or screwed to the case of the lock, to receive the levers or tumblers on any attempt being made to pick the lock—a sliding or covering plate to close the key-hole when any attempt is made to pick the lock—certain anti-friction rollers fixed on the latch-bolt and guide-arm — and a regulating screw passing through the centre of the knob, tapped into the end of the spindle for regulating the length thereof.

BARLOW, HENRY BERNOULLI, of Manchester. *Improvements in machinery for cleaning cotton and other fibrous materials.* (A communication.) Patent dated September 2, 1854. (No. 1919.)

This invention consists in the combination of a first and second picking cylinder with a certain wire drum, patented by Mr. F. A. Calvert, January, 1849. This drum is furnished with a revolving guard or beater, by which the motes or other impurities projecting from the teeth of the drum are struck down, falling on the first picking cylinder. The cotton is cleaned from the teeth of the wire drum by a brush which strikes it on to a grid, between the bars of which the loosened dust or other impurities drop on to the second picking cylinder; by this means the fly or fibre of cotton that descend with the dirt is carried forward to the wire drum, and the impurities are discharged through a grating. The cotton, after passing between wire cages, drops on an incline, from whence it falls into a suitable receiver, or is made into a lap by a lapping machine similar to those usually applied to blowers.

CALLAN, NICHOLAS, of Maynooth-college, Kildare, Ireland, professor. *Improvements in certain galvanic batteries.* Patent dated September 2, 1854. (No. 1920.)

Claims.—1. The use of the solutions in the proportions described under the first head as exciting agents, in the single fluid batteries therein specified. 2. The use of iron or cast-iron instead of the copper used in Daniell's battery, and in other similar constant batteries. 3. The use of sulphate of iron instead of the sulphate of copper used in Daniell's battery and similar constant batteries. 4. The use of iron or cast-iron and sulphate of iron for the copper and sulphate of copper used in Daniell's battery and other similar constant batteries, so that the negative element will be iron or cast-iron, and will be excited by a solution of sulphate of iron.

DECOSTER, PIERRE ANDRÉ, civil engineer, of Paris, France. *Certain improvements in extracting the saccharine parts of the sugar-reeds, and of other sacchariferous substances.* Patent dated September 2, 1854. (No. 1921.)

Claims.— 1. Constructing machinery or apparatus for chopping or cutting up sugar canes. 2. Extracting the saccharine juice or liquid from sugar canes, by means of a series of combined operations, consisting of the cutting up of the canes into small pieces, pressing, steaming, and again pressing them. 3. A mode of constructing centrifugal machines, with a detached drum capable of being readily removed and replaced, and perforated with long narrow slits widened at the exterior and having a central pipe or hollow stem for the admission of the clairce or purifying liquid. 4. Constructing centrifugal machinery with an arrangement of wings or fans, for deadening the shock or destroying the motion of the clairce as it flies out from the central stem. 5. Constructing centrifugal machinery with detached trellis or network, for removing the sugar from the perforated drum. 6. A mode of extracting the crystallized sugar from the molasses and impurities, by moulding it into loaves in detached moulds perforated with narrow slits, which moulds are fitted to revolving spindles and furnished with central pipes through which the clairce is introduced.

CRADDOCK, THOMAS, of Portway Foundry, Potter's-lane, Wednesbury, Staffordshire, engineer. *Certain improvements in the steam engine.* Patent dated September 2, 1854. (No. 1922.)

This invention consists—1. In the employment of India-rubber tubes for distributing the steam pressure over the backs of valves; and, 2. In the use of an arrangement of worm-wheels for giving motion to the eccentric.

KAY, RICHARD DUGDALE, of Accrington. *Improvements in machine printing.* Patent dated September 2, 1854. (No. 1923.)

This invention relates to what is termed lapping, and consists in using a series of thin cotton fabrics, or fabrics of linen warp and cotton weft, coated on one side with India-rubber cement, and folded with the uncemented surface outside. One of these folded fabrics is wound on to the cylinder to the thickness required, the pressure exerted in the act of winding causing the cement to permeate through the fabric, so that the whole becomes a solid mass.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

FRANCIS, HENRY, of the Strand, Westminster, engineer. *A machine for scutching flax, hemp, and other like fibrous materials.* Application dated August 26, 1854. (No. 1876.)

This machine consists of rough rollers mounted in pairs in a suitable frame, and each or both capable of two independent motions, one in the direction of their diameters, and the other in the directions of their lengths. The rollers are grooved, fluted, or otherwise roughened, or covered with a rough material.

DONOVAN, JAMES, of Church-path, Hackney, Middlesex, gentleman. *An improved mode of constructing steam boiler and other furnaces for the purpose of consuming smoke.* Application dated August 28, 1854. (No. 1881.)

The inventor provides immediately below the fire-bars air-ducts which lead from an air chamber at the front of the fireplace to another situated at the bridge, or formed by making the bridge hollow.

MACHIN, ISAIAH JAMES, of St. Giles-in-the-fields, Middlesex, machinist. *Improvements in cutting screws.* Application dated August 29, 1854. (No. 1885.)

This invention consists of a novel arrangement of steel rollers, with suitable guides and handles in lieu of the usual stocks and dies, by means of which either right or left-hand screws can be cut by simply reversing the action.

BURRIDGE, JOSEPH, of Great Portland-street. *Improvements in apparatus for closing fire-places.* Application dated August 29, 1854. (No. 1887.)

This invention consists in using shutters, in combination with fire-places, for the purpose of regulating the draft, extinguishing the fire, and preventing the escape of soot or dust.

REDON, JEAN DE, of Paris, France, civil engineer. *A new machine for cutting or preparing wood to be used in the manufacture of paper.* Application dated August 29, 1854. (No. 1891.)

The inventor describes a tool which consists of a circular toothed blade set on an axle, and so constructed that the under part of the teeth cut the wood in a curvilinear direction, and a support composed of two drums without bottoms, placed one within the other, leaving between them the necessary space for placing the logs of wood.

MATHIEU, JULES, of Paris, France, civil engineer. *Improvements in pumps.* (A communication.) Application dated August 30, 1854. (No. 1895.)

A flexible tube is bent round into a circular form by the inventor, and placed within a cylindrical box or hoop. A roller is mounted upon an arm attached to a shaft placed concentric with the box, and made

to compress the tube as it revolves, thus producing suction.

MEYERS, BARNET, of Savage-gardens, Tower-hill, Middlesex, importer and manuacturer. *Improvements in walking-stick guns.* (A communication.) Application dated August 30, 1854. (No. 1897.)

In carrying out this invention, the muzzle end of the piece, or the ground end of the stick, has screwed into it, within an external solid ferule, a short metal barrel or rifled muzzle-piece. This barrel is screwed out when the piece is to be loaded, and the projectile is then dropped in at the inner and slightly wider end. The explosive agent is a percussion cap.

NIMMO, WILLIAM, of Pendleton, Lancaster, spinner and manufacturer. *Improvements in machinery or apparatus for producing ornamental woven fabrics.* Application dated August 30, 1854. (No. 1898.)

These improvements relate to the production of fabrics by machinery in which a jacquard apparatus or its equivalent is used, and consists in so arranging the parts that the jacquard cylinder or its equivalent may cease to change at any required time, and continue to form the shed by successive operations of the same card or other such part.

LEHUGEUR, LOUIS PIERRE, mechanic, and MICHEL UTTINGER, gentleman, both of St. Denis, near Paris, France. *Improvements applicable to machinery for printing fabrics.* Application dated August 30, 1854. (No. 1899.)

In the improved machinery the colour-block or table is made elastic by means of springs, and is covered with a cloth, so that at each stroke of the printing-block fresh colour will be supplied, the apparatus being so arranged that the cloth and the colour which is contained in a reservoir or basin shall be kept together.

SEITHEN, JOHN, of Wakefield-street, Brunswick-square. *Improvements in apparatus for cutting squares of cork.* Application dated August 30, 1854. (No. 1900.)

The inventor employs a blade or knife attached to the end of a lever jointed to the side of a table, and governed in its movement by a guide. This blade moves at an angle to the edge of the table, so as to make an angular cut in its downward movement, the cork resting upon and projecting slightly beyond the table so as to come into the path of the blade.

ILLAKOWICZ, MICHEL NAPOLEON, artist, of Maddox-street, London. *Improvements in picture frames.* Application dated August 31, 1854. (No. 1902.)

The inventor describes certain expanding-picture frames made in eight principal pieces. The usual frames being divided into four, at the centres of the four pieces composing the frames, four other pieces are brought on to the back, and on these, by means of mechanism, the four corner pieces are made to slide in such manner that the proportion of the sides of the parallelogram, as well as the size of it, can be changed at pleasure.

WITTY, ROBERT CHRISTOPHER, of Torriano-avenue, Camden-road-villas, Middlesex, civil engineer. *Improvements in illumination by means of artificial light.* Application dated August 31, 1854. (No. 1903.)

This invention consists in placing a reflector in a central position within a circle of flame, or within a series of jets of flame placed in a circle, for the purpose of increasing the illuminating effect.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture of combs.* Application dated August 31, 1854. (No. 1905.)

This invention relates to the moulding of combs of vulcanized or hardened caoutchouc and gutta percha by means of pressure in a vacuum.

KÖNIG, EUGÉNE, of Rue du Temple, Paris, France, upholsterer. *Improvements in manumotive carriages.* Application dated August 31, 1854. (No. 1906.)

This invention relates to a particular arrangement and construction of wheeled carriages, the object being that the occupants may propel them from within by a simple action of one hand.

CAMPION, WILLIAM, of Nottingham. *Improvements in rotary knitting-machinery.* Application dated August 31, 1854. (No. 1907.)

The inventor adopts arrangements by which he is enabled to narrow the work or transfer loops from one or more needles at each end of the arms to other needles at the time that the course is being completed.

EDEN, GEORGE, of Norwood, Surrey. *Improvements in cooking utensils.* Application dated August 31, 1854. (No. 1909.)

These improvements consist—1. In constructing cooking utensils with an outer steam-tight casing, leaving a space all round the vessel for the reception of water, oil, or other liquid, according to the temperature required to be obtained; at the top of this casing there is an aperture over which a whistle or similar instrument is screwed or fixed when in use, so that attention may be called when boiling occurs. 2. In the employment of a spindle which descends into the cooking vessel and keeps the contents stirred. 3. In the adaptation of a whistle or thermometer to ordinary cooking utensils.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *An improved soap, to which he gives the name of Saponitoline.* (A communication.) Application dated September 1, 1854. (No. 1910.)

This invention consists in combining the following ingredients for the manufacture of soap, viz.: ordinary soap, 10 oz.; carbonate of soda, 13 oz.; lime, 7 oz.; boiled linseed, 5 oz.; grey salts, 1 oz.; sulphate of ammonia, ½ oz.; rain water, 7 lbs.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *An improved process of manufacturing alcohol from the stem and ear of maize.* (A communication). Application dated September 1, 1854. (No. 1912.)

In carrying out this invention the maize is cut into small pieces and crushed so as to form a kind of pulp which is submitted to fermenting and distilling processes.

LINDHEIM, MARIE LOUISE, independent lady, of Paris, France. *Certain improvements in the manufacture of bonnets or caps.* Application dated September 1, 1854. (No. 1913.)

The frame or skeleton of Madame Lindheim's improved bonnet or cap is made of wires radiating from the central portion or crown, and crossed by other wires of a curved or circular form, which are provided at intervals with hinges, which allow the two sides or the top and bottom of the bonnet or cap to be brought together, so that it may be packed up in a small compass.

EDWARDS, HEZEKIAH, of Islington, commission agent, and JAMES HODSON, of the same place, Middlesex, warehouseman. *Improvements in the formation of envelopes.* Application dated September 2, 1854. (No. 1916.)

The peculiarity of this invention consists in forming envelopes like paper bags, having one side open, and on the interior edge of it an adhesive coating.

FINLAY, WILLIAM, of Aylesford, Kent, superintendent of the Aylesford Pottery Company's Works. *Improvements in machinery for manufacturing bricks and tiles.* Application dated September 2, 1854. (No. 1918.)

"This invention relates to the manufacture of bricks and tiles, either solid or hollow, by compression, in place of forcing the clay or other plastic material through dies, and consists in the employment of a revolving door in combination with a piston or plunger and chamber, the piston being worked by a crank on the main shaft of the machine."

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in machinery applicable to the cutting, dressing, and polishing of stone.* (A communication.) Application dated September 2, 1854. (No. 1924.)

The inventor employs conical cutters, grooved spirally, and mounted in independent bracket-frames which are arranged radially and secured to a revolving disc plate keyed to a driving shaft, which is capable of longitudinal adjustment so as to bring up the cutters to the face of the stone to be operated upon. A platform running on wheels is provided for carrying the stone. When the polishing is to be effected, polishing tools are substituted for the cutters.

COWPER, EDWARD ALFRED, of Great George-street, Westminster, Middlesex, civil engineer. *Improvements in self-feeding furnaces, and in machinery for working such furnaces.* Application dated September 4, 1854. (No. 1925.)

The inventor constructs furnaces with fire-bars placed transversely, and capable of working up and down in suitable guides, being raised and lowered by means of levers or cams fitted on revolving or oscillating shafts so as to produce undulations or waves on the surface on which the fuel lies, thus propelling it towards the back of the furnace.

PROVISIONAL PROTECTIONS.

Dated January 26, 1855.

197. William Binns, of Claremont-villa, Victoria-grove, Brompton, Middlesex, consulting engineer, and James Haughton, of Bankside, New Mill, Oldham, Lancaster, engineer. Certain improvements in valves for stopping, retarding, and regulating the flow of steam, water, or other fluids.

Dated February 10, 1855.

313. Edward Sparkhall, of Cheapside, London, printer. Improvements in the exhibition of pictorial representations of various subjects.

Dated February 28, 1855.

433. Alexander Symons, of the Strand, Middlesex, gentleman. An egg-cooking apparatus. A communication.

435. Frederic Allarton, of High-street, Southwark, Surrey, chemist. Certain improvements in the method of administering iron as a remedy.

437. James Higgin, of Manchester, Lancaster, manufacturing chemist. Improvements in treating certain waste soap liquors, and obtaining therefrom certain products applicable to purposes not hitherto known.

439. Charles Frederick Stansbury, of Cornhill, London. An improved mode of ringing fog-bells. A communication from Charles G. Page, of Washington, United States of America.

441. George Mackay Miller, of Inchicore, Dublin, civil engineer, and John Wakefield, of the same place, engineer. Improvements in pistons for engines driven by steam or other elastic fluid, which improvements are also applicable to the pistons or plungers of reciprocating pumps.

443. Fischer Alexander Wilson, of Kennington, Surrey, gentleman. Improvements in closing and unclosing bottles, and other vessels used for con-

taining liquids, also in the modes of inserting, securing, and liberating liquids therein and therefrom.

445 Henry Constantine Jennings, of Great Tower-street, London, practical chemist. An improvement in the manufacture of soap.

447. George Ritchie, of New-cross, Deptford, Kent. An improvement in the manufacture of linings for articles of dress.

449. Bewicke Blackburn, of Clapham-common, Surrey. Improvements in the manufacture of pipes.

Dated March 1, 1855.

450. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. An improvement in rollers used in spinning. A communication.

452. Stanislas Vigoureux, manufacturer, of Rheims, French empire. Certain improvements in printing, ornamenting, and dressing woven and textile fabrics.

453. Thomas Sadleir, of Mulla Tullamore, Esq. An improved apparatus and method of manufacturing charcoal, which can also be applied to cooking and other purposes.

454. George Mackay Miller, of Inchicore, Dublin, civil engineer. Improvements in axles and axle-boxes of engines and carriages in use on railways.

455. Andrew Small, of Glasgow, Lanark, ship chandler. Improvements in marine compasses, and in apparatus applicable thereto.

457. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for rolling and shaping metals. A communication.

Dated March 2, 1855.

458. James Lewis, of Abergavenny, Monmouth, ironmonger. Improvements in stench-traps.

459. Thomas Dodds and Richard Leake, of Horseshoe-court, Ludgate-hill, London, lithographers, and William Fletcher, of Saint James-street, Old Kent-road, London, engineer. Certain improvements in the construction of a machine for heating all kinds and description of furnaces with coal or other gases.

460. George Lowry, of Manchester, machinist. Improvements in machinery for preparing and spinning flax, hemp, and other fibrous materials.

461. Constant Jouffroy Duméry, of Rue du Château d'Eau, Paris, France, civil engineer. Improvements in alarm and safety whistles for steam generators.

462. Charles Frederick Stansbury, of Cornhill, London. An improved drill and bit-stock. A communication.

463. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in slide-valves for steam-engines. A communication from Erasmus D. Leavitt the younger, of Lowell, United States of America.

464. William Hodges, of Stafford, boot and shoe manufacturer. Certain improvements in boots and shoes.

465. John Johnson, of Bow, Middlesex, drysalter. Improvements in temporary rudders.

466. William George Henry Taunton, of Liverpool, Lancaster, civil engineer and patent windlass purchase manufacturer. Improvements in pumps, pump-gear, and pump-buckets.

467. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in the construction of printing-presses. A communication.

468. John Coney, of Newhall-hill, Birmingham, Warwick, gun-maker. An improved construction of gun-lock.

Dated March 3, 1855.

469. John Woodley and Henry Herbert Swinford, of Limehouse, Middlesex, coopers. Improvements in apparatus for indicating and giving alarm in cases of fire.

470. André Bernard Vabre, of Saint Thomas's-street East, Surrey, civil engineer. Improvements in floors and roofs. A communication.

471. Benjamin Dickinson, and John Platts, of Clough House Mill, near Huddersfield, York, cloth-dressers. Improvements in machinery or apparatus used in finishing woollen and other textile fabrics.

472. William Hunt, of Tipton, Stafford, manufacturing chemist. Improvements in utilizing certain compounds produced in the process of galvanizing iron, and in the application of the same and similar compounds to certain useful purposes.

473. Thomas Henry Ryland, of Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of neck and dress-chains, bracelets, and other ornamental articles of dress, and in links used in the manufacture of the said chains and other ornamental articles of dress.

474. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in cleansing and preparing fibrous materials. A communication from Samuel W. Brown, of Lowell, Massachusetts, United States of America.

475 Joseph Revell, of Dukinfield, Chester, plasterer. Certain improvements in machinery or apparatus for propelling vessels.

476. John Octavius Williams, of Torquay, Devon, ironmonger. Improvements in camp stoves and cooking apparatus.

477. Thomas Metcalfe, of High-street, Camden-town, Middlesex, gentleman. Improvements in window-sashes.

478. Robert Boby, of Bury St. Edmunds, mechinist, and Thomas Cooper Bridgman, of the same borough, Suffolk, chemist. Improvements in corn-dressing and winnowing machines.

479. Timothy Walker Carter, of Massachusetts, United States of America. New and useful improvements in repeating fire-arms. A communication from Joshua Stephens, of Massachusetts.

480. Charles Iles, of Peel Works, Birmingham, Warwick, manufacturer. Improvements in apparatus for cutting, burnishing, and polishing cylindrical surfaces of metal and other substances.

481. Charles Iles, of Peel Works, Birmingham, Warwick, manufacturer. Improvements in the manufacture of tubes, knobs, and handles of doors, rollers of castors, and reels for cotton and thread.

Dated March 5, 1855.

483. Lewis James Paine, of Camberwell, and John Ryan, of Hatcham Improved portable utensils, such as buckets, canteens, baths, and other similar waterproof articles for containing liquids, also applicable for portable life-boats, buoys, or land-marks, and other compressible articles.

485. John Dawson, of Northwich, Chester, saddler. An improvement in saddles.

487. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in projectiles. A communication.

489. John Lewis, of Elizabethtown, New Jersey, United States of America. Improvements in rigging and sparring vessels.

493. Auguste Edouard Loradoux Bellford, of Essex-street, London. Certain new and useful improvements in the oscillating steam engine. A communication from John Andrew Reed, of New York, United States of America.

Dated March 6, 1855.

495. William Jenkins, of Neath Abbey, Glamorgan, moulder. An improved method of casting copper cylinders, copper vessels, and other copper forms.

497. George Washington Bowlsby, of the Castle Hotel, Oxford-street, Middlesex. An improvement in closing the windage when discharging cannon.

499. Adam John Burr, of Alfred-road, Paddington, Middlesex, civil engineer. Improvements in gas-meters.

501. Eugène Tardif, of Bruxelles, Belgium, merchant. An improved construction of numbering apparatus.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March 20th,* 1855.)

2395. Frederick Ransome. An improvement in preparing oxides and carbonates of lead or zinc, and carbonate or sulphate of barytes, to render the same suitable for painting or coating surfaces.

2400. The Honourable William Edward Fitzmaurice. Improvements in bullets, shells, and other projectiles.

2424. George Henry Ingall. An improved method of communication between passengers and guards, &c., for the prevention of loss of life and accidents on railways.

2425. Peter Knowles and Edward Kirby. Improvements in machinery for opening, cleaning, and preparing cotton, and other fibrous materials.

2434. Richard Peters. Improvements in steam-engines.

2449. Edouard Belmer. A new manufacture of apparatus for warming rooms and work-shops.

2479. Henri Jules Duvivier and Henri Chaudet. Improvements in treating gutta percha.

2499. Felix Delacour. Improvements in fire-screens.

2509. John Abraham. Improvements applicable to draining.

2513. John Moore Hyde. Improvements in iron steam-ships, and in boilers and machinery for propelling the same.

2544. Henry Strong. Improvements in the prevention of "back smoke" in chimneys.

2576. Samuel Heseltine. Improvements in the construction of cannon shot and shell.

2618. Auguste Edouard Loradoux Bellford. Improvements in sewing machines. A communication.

2670. Auguste François Joseph Favrel. A new machine for beating precious metals applicable to leather and to forging.

2697. Jabez Smith. An improved buckle or fastening.

2763. Bernard Hughes. The better and more effectual heating of bakers' ovens.

5. Stephen Giles. An improved ratchet brace.

61. Thomas Wilson. An improvement or improvements in the manufacture of bands used in the construction of small arms.

182. John Livesey. Improvements in lace machinery.

197. William Binns and James Haughton. Certain improvements in valves for stopping, retarding, and regulating the flow of steam, water, or other fluids.

227. David Moline. Improvements in the manufacture of metallic window-frames and skylights. A communication.

313. Edward Sparkhall. Improvements in the exhibition of pictorial representations of various subjects.

359. John Hackett. A new and improved fabric or fabrics for the manufacture of umbrellas, parasols, and buttons, and for other purposes.

360. John Hackett. An improved leather cloth, and the employment thereof for various useful purposes.

369. Charles Roper Mead. An improved construction of gas regulator.

380. Thomas Organ. A new or improved dress-fastening.

397. Frederick William East and John Mills. Improvements in destroying the noxious vapours arising from boiling oil, bones, and other matters in the open air.

413. John Scott Russell. An improvement in the construction of ships or vessels to facilitate the use of water as ballast.

421. Charles Henry Roberts. An improvement in the manufacture of rubbers for painters and others.

431. Alexander Theophilus Blakely. Improvements in ordnance.

437. James Higgin. Improvements in treating certain waste soap liquors, and obtaining therefrom certain products applicable to purposes not hitherto known.

438. Ward Holroyd. An improved method of "fencing" horizontal and other shafts in factories and other places where such fencing may be required for the purpose of preventing accidents.

440. John Gedge. Improvements in apparatus or machinery for stopping or retarding vehicles used on railways. A communication from Sophia Richter, of Gorlitz, Prussia.

455. Andrew Small. Improvements in marine compasses, and in apparatus applicable thereto.

458. James Lewis. Improvements in stench-traps.

460. George Lowry. Improvements in machinery for preparing and spinning flax, hemp, and other fibrous materials.

467. Alfred Vincent Newton. Improvements in the construction of printing-presses. A communication.

472. William Hunt. Improvements in utilizing certain compounds produced in the process of galvanizing iron, and in the application of the same and similar compounds to certain useful purposes.

475. Joseph Revell. Certain improvements in machinery or apparatus for propelling vessels.

479. Timothy Walker Carter. New and useful improvements in repeating fire-arms. A communication from Joshua Stevens, of Massachusetts.

501. Eugène Tardif. An improved construction of numbering apparatus.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed March 16, 1855.

2029. Victor Athanase Pierret.
2037. Henry Hudson.
2039. Jean Antoine Passet.
2047. Peter Spence.

Sealed March 20, 1855.

2043. James Egleson Anderson Gwynne.
2048. George Collier and Samuel Thornton.
2055. Robert Pinkney.
2058. Henry Alexandre Ganetrean.
2061. Philip James Chabot.
2963. Henri Catherine Camile de Ruolz and Anselme Louis de Fontenay.
2065. Joshua Bacheler Halsey.
2070. Thomas Clayton and Robert Harrop.
2072. Thomas Griffiths.
2082. John Rogerson and James Brimelow.

2125. Wright Townend.
2140. William Bridges Adams.
2144. William Frost.
2152. William Chambers.
2159. Robert Maynard.
2171. William Chubb.
2224. Richard Green.
2274. Richard Hugh Hughes.
2279. John Henry Johnson.
2309. John Henry Johnson.
2362. Leone Glukman.
2583. Thomas Brown and Peter Mac Gregor.
2602. William James Harvey.
2645. Robert Adams.
2751. Thomes Thorneycroft.

1855.

82. Joseph Ray Hodgson.
165. John Henry Pape.
166. Robert Johnston.
170. William Kilgour.
191. John Henry Johnson.
196. John Lamacroft.

NOTICES TO CORRESPONDENTS.

A Thirty Years' Subscriber.—We have not met with any published description of Ruhmkorff's coil apparatus. We believe they are supplied only by Ruhmkorff himself, and there is, as is evident from their effects, some peculiar contrivance adopted in their construction.

The communications of Mr. Baddeley and Mr. Emmett are received, and shall be published, if convenient, in our next.

If *G. A.* will call upon the Editor, he will be happy to furnish him with answers to his several questions.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Machin, and Co. Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1651.] SATURDAY, MARCH 31, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

WENHAM'S PATENT BREECH-LOADING FIRE-ARMS.

WENHAM'S PATENT BREECH-LOADING FIRE-ARMS.

(Patent dated February 1, 1854.)

Mr. F. H. Wenham, of Effra Vale Lodge, Brixton, has patented certain improvements in breech-loading fire-arms, by which the breech is made to turn and rotate on a crank, so as to be forced forward towards the barrel and locked fast; and in which a "direct action primer" is employed.

Fig. 1 of the engravings on the preceding page is an elevation, fig. 2 a section, and fig. 3 a plan of a gun constructed with these improvements. The back end of the movable breech, *a*, turns on a crank pin, *b*, and is fixed thereto by means of the cap, *c*, screwed on to the end of the breech. The forward end of the breech is made in the form of a truncated cone, which fits into a corresponding cone made in the inner end of the breech case or barrel. The shaft of the crank is of larger diameter than the crank pin, and rotates in two opposite openings made in the sides of the breech case, which is made of iron, brass, or gun-metal, and is so formed that the barrel, *e*, may be screwed into it, as shown in figs. 1, 2, 3. To the end of the crank shaft which projects through the breech case is firmly fixed a handle, *f*. *g* is a spring catch, for keeping the handle down in place when firing. Fig. 4 is a plan of the crank and handle; and fig. 5, a sectional elevation of the same.

Fig. 2 shows the breech tilted up in the proper position for loading. The method of bringing it into this position is as follows;—Unlock the handle by pressing back the spring catch, then turn the handle in an upward direction, which will draw the breech backwards; this effect is produced by the crank form of the breech axis. When the handle has been turned about a quarter round, or is at right angles to its normal position, it will have drawn the fore end of the breech out of the cone in the breech case, and on further turning the handle the breech will travel with it and rise into the position shown by fig. 2, and by still further pressing down the handle the breech will be forced against the tail-piece, *h*, and be firmly fixed into the position for loading. The breech is returned to its place by simply returning the handle to its first position.

The second part of the invention, which relates to a method of self-priming, is also illustrated in the engravings. A, fig. 2, is the nipple, which by the tilting of the breech is placed into a cavity made to receive it in the tail-piece, *h*. The position of the nipple for priming must be below the upper surface of the tail-piece; a hole, B, is bored in the wooden handle of the gun of the proper diameter for admitting the caps endways. The caps are forced through a hole in the tail-piece, *h*, in a direct line upon the nipple by means of the rod, C, which is urged forward by the spiral spring, D, contained in a larger hole bored in the butt end of the stock. A slit, E, is cut in the side of the stock, to allow a pin to pass through, which pin is screwed into the base of the sliding-rod, for the purpose of drawing it back by means of the external stud, F. When the end of the rod is drawn back past the hole, G, fig. 1, the primer is filled with caps, by dropping them into the hole separately, and allowing them to fall forward till the primer is full. The caps are kept back till required, simply by means of a spring, H (shown in figs. 1, 2, and 3), which catches against the lower edge of the cap; the end of the spring projects through the side of the breech case, as shown in figs. 1 and 3. When the breech is brought into the exact position for charging, the projecting end of the spring, H, is pressed down by a stud, *i*, forming part of the disc, *a'*, screwed on to the flat end of the crank; this causes a cap to be released and thrust directly on to the nipple, and when this, together with the cap, is raised out of the cavity in the tail-piece, the spring will return and keep back the next cap till required.

The third part of the invention consists of a method of preventing the breech from being unlocked while the hammer is down, and also of preventing the hammer from reaching the nipple, unless the breech and handle are in the proper and safe position for firing. This is effected by what is termed by the inventor the "safety disc." *a'*, figs. 1 and 3, is a disc or plate screwed and fixed firmly on to the flat end of the crank shaft. The part of the disc near to the hammer, *b'*, is cut away, so as to allow the projecting part, *c'*, of the hammer just to pass close when the hammer is let down. This will prevent the breech-handle from being turned when the hammer is in this position. If, when the hammer is raised, the crank handle is not locked in place, and consequently is in an unsafe position for firing, the projecting part, *c'*, of the hammer will not pass the disc, but strike on the edge of it, and thus prevent the hammer from striking the priming.*

---

* For the patentee's claims, see p. 311, vol. lx.

PROFESSOR FARADAY ON MAGNETIC PHILOSOPHY AND THE PHILOSOPHY OF FORCE.

(*Concluded from page* 222.)

A very important though a difficult task which the natural philosopher has to perform, is to draw in his mind a distinct boundary separating the facts of science from the hypotheses with which they are associated—to make himself conscious of the exact limit where facts terminate and conjecture begins. One ought always to hold himself in readiness to part with an hypothesis at the shortest notice, because its office is not a permanent one. Its only proper use is that of a thread upon which we string the ascertained phenomena of nature; and as our real acquaintance with nature increases, we from time to time find our threads grow insufficient for our purpose, and are driven to replace them by better and stronger ones.

Many scientific men of considerable eminence think that some of our present theories of natural matters are about to undergo a change, making it particularly necessary to put a proper value on what is supposititious and what is really matter of fact. On this head, among others, we have the following in relation to magnetism, from Professor Tyndall, in a letter in the March number of the *Philosophical Magazine*: he says, "We are so accustomed to regard the phenomena of this portion of science through the imagery with which hypothesis has invested them, that it is extremely difficult to detach symbols from facts and to view the latter in their purity. This duty, however, is now forced upon us; for the moment we reflect upon the results of recent scientific research, the more deeply must we be convinced of the impossibility of reconciling these results with our present theories." Now whatever theory is offered to us must, in our judgment, have better recommendations to our notice than are derived from the alleged advantage in point of simplicity, which the *medial* theories are said to possess. All such theories owe their origin to the imagined necessity there is for media, by and through which such powers as magnetism, electricity, light, heat, and gravitation may act. Their authors, we think, do not always keep before them the proper use and service of an hypothesis. For when the theory is as extraordinary and as complicated as the facts which it ought to simplify, it tends to diminish rather than increase the facilities for acquiring and extending our knowledge.

We think the theory of the physical lines of magnetic force is very open to objection on this ground, if it be not on the additional one of conveying false notions of the condition of the space which surrounds a magnet. For these lines have offices ascribed to them which they are incapable of fulfilling.

But further, the utility of the medial theories in general certainly admits of some question. In the cases of light and heat, they seem to be most favourably placed, but even here perhaps their influence is injurious, as tending to induce the mind by habit to put more trust in them than they deserve, and to give rise to the belief that we know more about these matters than we really do. We may safely say that to some minds it is as easy to conceive and understand that two bodies should act on each other at a distance as in contact,—that two bodies should act on each other through a void, and immediately, as that their action should be propagated from particle to particle of a medium placed between them to afford a means of communication. The attraction of the earth on the moon does not seem more inexplicable, if we regard it as acting through empty space and directly from one body to the other, than it does if we imagine some *fluid* medium placed between them, such that its particles shall each attract its neighbour and the two bodies in question. If there be a difference, the simplicity seems on the side of the non-medial action, for there we have a single action, whilst with the medial we are forced to think of an infinite number of attractions operating from link to link of the chain. So it is with the theory of the boreal and austral fluids to explain magnetism. The magnet is endowed with two fluids, which are supposed self-repellant and mutually attractive. These are supposed to be in union in an ordinary piece of iron, and separated and arranged in the directions of the poles in the magnet. Thus we imagine two substances about which we know *nothing*, and endow them with the properties which we see exist in the magnet itself, which we have *some* knowledge of, and think we have, in some degree, explained the mode of action. It would perhaps be more just to say that we have complicated it. These objections will not perhaps seem altogether inapplicable to the hints at a theory of physical force in general, which Professor Faraday threw out in his late lecture, and which we shall quote at length, commenting as we go.

"It is probably of great importance," he says, "that our thoughts should be stirred up at this time to a reconsideration of the general nature of physical force, and especially to those forms of it which are concerned in actions at a distance. These are,

by the dual powers, connected very intimately with those which act at insensible distances; and it is to be expected that the progress which physical science has made in latter times will enable us to approach this deep and difficult subject with far more advantages than any possessed by philosophers of former periods. At present we are accustomed to admit action at sensible distances, as of one magnet upon another, or of the sun upon the earth, as if such admission were itself a perfect answer to any enquiry into the nature of the physical means which cause distant bodies to act upon each other; and the man who hesitates to admit the sufficiency of the answer, or of the assumption on which it rests, and asks for a more satisfactory account, runs some risk of appearing ridiculous or ignorant before the world of science. Yet Newton, who did more than any other man in demonstrating the law of action of distant bodies, including amongst such the sun and Saturn, which are nine hundred millions of miles apart, did not leave the subject without recording his well-considered judgment, that the mere attraction of distant portions of matter was not a sufficient or satisfactory thought for a philosopher. That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a vacuum, without the mediation of anything else, by and through which their action and force may be conveyed from one to another, is, he (Newton) says, to him a great absurdity. Gravity must be caused by an agent acting constantly according to certain laws; but whether this agent be material or immaterial, he leaves to the consideration of his readers. This is the onward-looking thought of one who, by his knowledge and like quality of mind, saw in the diamond an unctuous substance coagulated, when as yet it was known but as a transparent stone, and foretold the presence of a combustible substance in water a century before water was decomposed or hydrogen discovered; and I cannot help believing that the time is near at hand when his thought regarding gravity will produce fruit: and, with that impression, I shall venture a few considerations upon what appears to me the insufficiency of the usually-accepted notions of gravity, and of those forces generally which are supposed to act at a distance, having respect to the modern and philosophic view of the conservation and indestructibility of force."

We do not think that the admission of the action of one body on another at a distance can be very generally regarded as "a perfect answer to any enquiry into the nature of the physical means which cause distant bodies to affect each other;" because neither this admission, nor any other we have ever met with, contains the slightest shadow of an answer to such an enquiry. Many men of science there may be, indeed, who would look upon such an enquiry as a hopeless thing, considering it *unanswerable*.

The proposition that all bodies attract each other with a force varying directly as the mass, and inversely as the square of their distance, is so broadly general, that it is very readily received by most persons when they find that there are no known facts which are in discord with it, and none which have any relation to the hypothesis which do not harmonize with it. Thus we may, perhaps, say that it is regarded as a simple and independent *fact*, just as an axiom of Euclid is looked on as a simple and independent *truth*, and the attempt to decompose the former into facts more elementary, appears much in the same light as an attempt to demonstrate the latter. There is one very important disadvantage affecting any hypothesis formed to reduce the case of bodies acting on each other at a distance to that of the action of bodies in close proximity on each other; it is this: the proposition that bodies may attract each other immediately and at a distance, is very much *more general* than, and quite as simple as, that they should so act on each other when in each other's neighbourhood, for action at an *insensible* distance may plainly be considered as a particular case of action at a *finite* distance. The commonly-received hypothesis is again much nearer to known facts than any involving the idea of an agent or medium. And, indeed, we have quite as good ground for supposing that two quantities of matter can affect each other at a distance, as for supposing that they can affect each other at all. It is quite as satisfactory to our mind to say that the sun attracts the earth directly without the interference of a third entity, and in consequence of the inherent qualities of the two bodies, as it is to say that the various particles of a mass of iron hold together, by reason of an attraction of cohesion which they exert upon each other. In either case we make an hypothesis which comes nearest to the facts as they appear to us. In the case of the tenacity of the iron, we know that the particles resist separation, and seeing nothing external or independent of the body in which the cause of such an effect can reside, we conclude, very naturally, that it is resident in the body itself, and we *call* it cohesion. So, also, with the supposed attraction of the sun for the planetary bodies; it is but the result of the distillation of facts. The facts are such as these. It is shown that the earth moves in such a manner as to make it certain that she is acted

on continually by a force, whose direction always passes through the sun, and the amount of which varies inversely as the square of the distance from that luminary; and seeing no third body or substance in which the cause of this mode of motion can exist, we directly and (as it seems to us) most simply suppose the cause of this motion to lie among the qualities of the bodies themselves. And we cannot help contending that, if it be absurd and unphilosophical to suppose "that gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance, through a vacuum, without the mediation of anything else," then it is absurd and unphilosophical to suppose two bodies or two particles ever can attract each other at all without the mediation of anything else. The ground for the one hypothesis is as good as that for the other. We might say, without being considered devoid of philosophical insight, that the inherence of gravity in matter seems to us quite as possible and, at present, quite as well founded a dogma as the inherence of opacity or of any other quality.

Mr. Faraday proceeds to say:

"The notion of the gravitating force is, with those who admit Newton's law but go with him no further, that matter attracts matter with a strength which is inversely as the square of the distance. Consider, then, a mass of matter (or a particle), for which present purpose the sun will serve, and consider a globe like one of the planets, as our earth, either created or taken from a distant space and placed near the sun, as our earth is;—the attraction of gravity is then exerted, and we say that the sun attracts the earth, and, also that the earth attracts the sun. But if the sun attracts the earth, that force of attraction must either arise *because* of the presence of the earth near the sun; or it must have preexisted in the sun when the earth was not there. If we consider the first case, I think it will be exceedingly difficult to conceive that the sudden presence of our earth, ninety-five millions of miles from the sun, and having no previous physical connexion with it, nor any physical connexion caused by the mere circumstance of juxtaposition, should be able to raise up in the sun a power having no previous existence. As respects gravity, the earth must be considered as inert, previously as the sun; and can have no more inducing or affecting power over the sun than the sun over it: both are assumed to be *without* power in the beginning of the case; how then can that power arise by their mere approximation or coexistence? That a body without force should raise up force in a body at a distance from it is too hard to imagine; but it is harder still, if that can be possible, to accept the idea when we consider that it includes the *creation of force*. Force may be opposed by force, may be diverted, directed partially or exclusively, may even be converted, as far as we understand the matter, disappearing in one form to reappear in another; but it cannot be created or annihilated, or truly suspended, that is, rendered existent without action or without its equivalent action. The conservation of power is now a thought deeply impressed upon the minds of philosophic men; and I think that, as a body, they admit that the creation or annihilation of force is equally impossible with the creation or annihilation of matter. But if we conceive the sun existing alone in space, exerting no force of gravitation exterior to it; and then conceive another sphere in space having like conditions, and that the two are brought towards each other; if we assume that by their mutual presence each causes the other to act,—this is to assume, not merely a creation of power, but a *double creation*, for both are supposed to rise from a previously inert to a powerful state. On their dissociation they, by the assumption, pass into the powerless state again, and this would be equivalent to the annihilation of force. It will be easily understood, that the case of the sun or the earth, or of any of the two or more acting bodies, is reciprocal;—and also that the variation of attraction, with any degree of approach or separation of the bodies, involves the same result of creation or annihilation of power as the creation or annihilation (which latter is only the total removal) of either of the acting bodies would do."

The law of gravitation may be stated thus: let m, and m', be the masses of two bodies which act on each other at a distance, d, from the centre of gravity of one to that of the other; then the expression for the force which tends to make them move directly towards each other is, $\frac{m \cdot m'}{d^2} k$, where k is some determinable constant. This is, we believe, a tolerably well established *fact*, and in no degree an hypothesis. And it is absolutely necessary, that we suppose the *inherent qualities* of the bodies themselves to have *something* to do with the production of such an effect; for we, at least, cannot suppose that they are *altogether* independent of it. Moreover, we know of nothing else which has any direct connexion with the phenomenon. So, the simplest thing we can do, and we do it intuitively, is to suppose that innate qualities of the bodies have *all* to do with the matter, and we say the bodies

themselves exert a mutual attraction, varying directly as the product of their masses, and inversely as the square of the distance between their centres of gravity. This is, as we view it, the argument for the law of gravitation as usually received and expressed, in so far as it is hypothetical; and we see nothing in Mr. Faraday's observations to diminish its weight in the slightest degree; but of this, of course, our readers can judge for themselves, as they have the whole of his arguments before them. It will be perhaps difficult to refute them, because they are not clearly expressed, and are therefore liable to be misapprehended. For instance, in the foregoing quotation, we see the sentence: "if the sun attracts the earth, that force of attraction must either arise, *because* of the presence of the earth near the sun; or it must have pre-existed in the sun when the earth was not there." A more erroneous proposition than this could hardly be taken as the foundation of an argument. In the first place, the term "force" is used as if it denoted a something of which we have an immediate knowledge, and of which we could predicate the various qualities which belong to it as a distinct entity or substance, such as we usually regard heat. Instead of which, the word force denotes an abstract and difficultly grasped idea, something of which we have no direct knowledge at all; we are cognizant of its effects alone. Philosophically the word force can be considered only as the name given to what we conceive to be the cause which produces, or tends to produce, motion in some material substance. Any one who reflects a moment on the matter will perceive that any idea of *force*, as an independent existence, is not to be obtained. Our notion of it, if it may be called one, is obtained from the sensation we feel when the parts of our bodies have a relative motion, or a tendency to relative motion, impressed upon them. Hence, to say that the force with which the sun may attract the earth could be present in the sun independently of the earth's existence, is to use a solecism; for by the definition, there can be no force existent where there is nothing to be moved, or to have a tendency to move imparted to it. Again, the use of the word "presence" in this same proposition is very objectionable, because no two bodies existent in space can possibly be absent from each other; for all the purpose of our argument, to exist is to be present with everything in the universe; so that the first of the alternatives in the dilemma, if it has a meaning, implies merely, that if there be any attraction, it is the result of the *joint existence* of the earth and sun, and this is either a *truism* or *nothing*.

But there is a lower method which would suffice to dispose of these premises. Thus if we could permit the language to pass unchallenged, there would still be the objection, that all the alternatives are not enumerated in the argument. It ought to have commenced thus: "'If the sun attracts the earth, that force of attraction must either arise *because* of the presence of the earth near the sun; or it must have pre-existed in the sun when the earth was not there;' or it must have existed in the earth; or it must have existed partly in the earth and partly in the sun." But we will leave the rest of the paragraph to the reader, and just point to the proof brought to support the notion, that two bodies cannot of themselves merely exercise an attraction on each other.

The idea that bodies act mutually at a distance, we are told, involves the notion of the creation of force; so that if our earth be suddenly introduced to the sun, force is created,—"a thing almost impossible to conceive," says Professor Faraday. But when we look at this statement, we see that the introduction of the earth, or of any other body, to the sun, means the introduction of that body to space, or its creation. Now it is hardly fair to call on us to imagine the creation of a quantity of matter, and then tell us that it is next to impossible to conceive the creation of force, which is the mere adjunct of matter. Why, with the knowledge of facts which we possess, it is far easier to conceive the creation of matter *including* that of force, than to conceive that of either without the other. But here follow the concluding remarks of the lecture:

"Such, I think, must be the character of the conclusion, if it be supposed that the attraction of the sun upon the earth arises because of the presence of the earth, and the attraction of the earth upon the sun because of the presence of the sun; there remains the case of the power, or the efficient source of the power, having pre-existed in the sun (or in the earth) before the earth (or the sun) was in presence. In the latter view it appears to me, that consistently with the conservation of force, one of three sub-cases must occur. Either the gravitating force of the sun, when directed upon the earth, must be removed in an equivalent degree from some other bodies, and when taken off from the earth (by the disappearance of the latter) be disposed of on some other bodies; or else it must take up some new form of power when it ceases to be gravitation, and consume some other form of power when it is developed as gravitation; or else it must be always existing around the sun through infinite space. The first sub-case is not imagined by the usual

hypothesis of gravitation, and will hardly be supposed probable; for if it were true, it is scarcely possible that the effects should not have been observed by astronomers, when considering the motions of the planets in different positions with respect to each other and the sun. Moreover, gravitation is not assumed to be a dual power, and in them only as yet have such removals been observed by experiment, or conceived by the mind.

"The second sub-case, or that of a new or another form of power, is also one which has never been imagined by others in association with the theory of gravity. I made some endeavours experimentally to connect gravity with electricity, having this very object in view (*Phil. Trans.* 1851. p. 1), but the results were entirely negative. The view, if held for a moment, would imply that not merely the sun, but all matter, whatever its state, would have extra powers set up in it if removed in any degree from gravitation; that the particles of a comet at its perihelion would have changed in character by the conversion of some portion of their molecular force into the increased amount of gravitating force which they would then exert; and that at its aphelion this extra gravitating force would have been converted back into some other kind of molecular force, having either the former or a new character, the conversion either way being to a perfectly equivalent degree. One could not even conceive of the diffusion of a cloud of dust, or its concentration into a stone, without supposing something of the same kind to occur, and I suppose that nobody will accept the idea as possible. The third sub-case remains, namely, that the power is always existing around the sun and through infinite space, whether secondary bodies be there to be acted upon by gravitation or not; and not only around the sun, but around every particle of matter which has existence. This case of a constant necessary condition to action in space, when, as respects the sun, the earth is *not* in place, and of a certain gravitating action as the result of that previous condition when the earth *is* in place, I can conceive, consistently as I think, with the conservation of force: and I think the case is that which Newton looked at in gravity; is, in philosophical respects, the same as that admitted by all in regard to light, heat, and radiant phenomena; and in a sense even more general and extensive, is that now driven upon our attention in an especially forcible and instructive manner, by the phenomena of electricity and magnetism, because of their dependence on dual forms of power."

The reasoning here applied to the subject of gravitation would lead to any kind of conclusion we pleased. Of course, what is said in the above extract implies that the attraction of the earth and sun, or the force which impels them towards each other, would exist in space, even if those bodies themselves were annihilated; *for it is clearly as independent of the existence of the sun as it is of that of the earth*, and, as it has been shown, independent of that of the earth; *ergo*, it is independent of the existence of both!

It is quite clear that if the views of scientific men on this subject are to be revolutionised, the work must be done by reasoning more cogent than this adopted by Professor Faraday; for such arguments will have no power to influence anything so well-grounded as the law of gravitation as at present regarded by philosophers. Hypotheses are very seldom so ill constructed as to be assailable by *à priori* objections like those brought against the received law of gravitation. No hypothesis of any importance has ever been proved erroneous by such means. Such have always fallen out of use, either because they have proved themselves inconsistent with *facts* discovered after their construction, or because they have been displaced by others of more general application, and of greater service to the mind of man. Hence, before we give up the hypothesis that the tendency of bodies to move towards each other is wholly due to their inherent qualities, we must be shown either that it is inconsistent with known *facts*, or that its preservation in preference to some other obstructs the progress of human knowledge. To this end we imagine Professor Faraday has not advanced a step; and, indeed, we do not think it likely that any one will construct an hypothesis which shall require the renunciation of our present law; we think it more likely, if any step be taken in this direction, that it will be the inauguration of some law of matter, more general, of course, but including, and therefore dispensing with our present hypothesis. We have seen some attempts in this direction, though none so successful as to carry all objections before, and prove themselves capable of doing effectually all their authors hoped from, them. We will give one instance, which is deserving of some attention. It is that of M. Mosoti; an account of it is given by Mr. Babbage, in his "Ninth Bridgewater Treatise," and we cannot do better than quote his words. The reader will observe, that some real advantages would result, if *facts* could be shown to be in harmony with some such hypothesis as the following. We shall not specify them here, as they are made out sufficiently in the quotation itself:

"Ever since the period when Newton established the great law of gravity, philosophers have occasionally speculated on the existence of some more comprehensive law, of which gravity is itself a consequence. Although some have considered it vain to search for a more general law, the great philosopher himself left encouragement to future inquiries; and the time, perhaps, has even now arrived, when such a discovery may be near its maturity. It would occupy too much space to introduce many illustrations of this opinion; there is, however, one which deserves attention, because it is not merely a happy conjecture, but the hypothesis on which it rests has been carried out by its author, through the aid of profound mathematical reasoning, to many of its remote consequences.

"M. Mosoti has shown that, by supposing matter to consist of two sorts of particles, each of which repels similar particles, directly as the mass and inversely as the squares of their distances, whilst each attracts those of the other kind, also according to the same law, then the resulting attractions explain all the phenomena of electricity, while there remains a residual force acting at all sensible distances, according to the law of gravity.

"*Many of the discoveries of the present day point towards some more general law; and many philosophers of the present time anticipate its near approach.* Under these circumstances, it may be interesting as well as useful briefly to state the principles which such a law *must* comprehend; and to indicate, however imperfectly, the path to be pursued in the research.

"If matter be supposed to consist of two sorts of particles, or rather, perhaps, of two sorts of centres of force of different orders of density; and if the particles of each order repel their own particles, according to a given law, but attract particles of the other kind, according to another law—then, if we conceive only one particle of the denser kind to exist, and an infinite number of the other kind, that single particle will become the centre of a system, surrounded by all the others, which will form around it an atmosphere denser near the central body.

"If we conceive a stream of particles similar to those forming the atmosphere to impinge upon it, so as just to overcome its resistance, they will, whilst continually producing undulations throughout its whole extent, gradually increase its magnitude, until it attains such a size that the repulsion of the particles at the outer surface of this enlarged atmosphere is just balanced by the attraction of the central particle. If the stream continue after this point is reached, the whole outer layer will be pressed a little beyond the limit of attraction, and will fly off at right angles to the surface, which might then be said to radiate.

"If the whole of the space in which such a central particle with its atmosphere is placed, is itself full of atmospheric particles, then their density will increase in approaching the central body; and if a stream of such particles were directed towards the centre, they might produce throughout the atmosphere vibrations, which would be transmitted from it in all directions.

"If two such central particles, with their atmospheres, exist at a distance from each other, they will be drawn together by a force depending on the *difference* between the mutual repulsion of their atmospheres and central bodies respectively for each other, and the attraction of each central particle for its neighbour's atmosphere: and in order to coincide with the existing law of nature, this force must be directly as the mass and inversely as the square of the distance. The other conditions which such a law must satisfy, are—

"1. That the juxta-position of such atoms must, in some circumstances, form a solid body.

"2. In other circumstances, a fluid.

"3. That, again, in still other circumstances, its particles shall repel each other, or the body become gaseous.

"4. In the first state the body must possess cohesion, tenacity, malleability, elasticity; the measure and extent of each of which must result generally from the original law, and in each particular case from the constants belonging to the substance itself.

"5. In the second state, it must possess capillarity, susceptibility of being compressed without becoming solid, as also elasticity.

"But besides these, the central atoms must admit of a more intimate approach, so that their atmospheres may unite and form one atmosphere. This might constitute chemical union. Binary compounds might then (supposing the distance between the two central particles to be very small, compared to the diameters of the atmospheres) have atmospheres not quite spherical, and attracting differently in different directions; thus possessing polarity. Combinations of three or more atoms as the central body of one atmosphere, might give great varieties of attractive forces. Each different combination would give a different atmosphere; and the equation to its surface might perhaps become the mathematical expression of the substance it constitutes. Thus all the phenomena produced by bodies, acting chemically on each other,

might be deduced from the comparison of the *characteristic* surfaces of the atmospheres of their atoms. Another result also might ensue. Two or more central atoms uniting, might either not be able to retain the same amount of atmosphere, or they might possibly be able to retain a larger quantity. If the particles of such atmospheres constituted heat, it would in the former case be given out, and in the latter absorbed by chemical union.

"Hence, the whole of chemistry, and with it crystallography, would become a branch of mathematical analysis, which, like astronomy, taking its constants from observation, would enable us to predict the character of any new compound, and possibly indicate the source from which its formation might be anticipated."

Although this hypothesis relates to matters so intricate and so delicate, that it seems impossible to make the observations necessary to test its practical value, yet it is sufficiently plausible to be interesting, while it gives one some idea of the immense difficulties to be overcome by any one who would succeed in such a work.

We have no space left for further comment, as our notice of Professor Faraday's lecture has already outgrown the limits which we assigned ourselves at the outset. The eminence of Mr. Faraday's position as a man of science, and the authority given to his opinions by the greatness of his experimental knowledge, which has been acquired with almost unprecedented zeal, and associated with a singularly pure devotion to truth, make it incumbent upon us to put forth any objections we may see to the deductions which he has made from his experience.

GOVERNMENT PATENT OFFICE LIBRARY AND READING - ROOM.

A library and reading-room has recently been established in connection with the Office of the Commissioners of Patents, Quality-court, Chancery-lane, and is now open to the public, free of charge. The library contains "The Chronological Index of Patents," granted under the Act of James I., from March, 1617, including all those which were commenced before the 1st October, 1852; the "Alphabetical Index of Patentees of Inventions" for the above period; the "Subject Matter Index" of patents for the same period; and the "Reference Index of Patents," pointing out the office in which each enrolled specification of a patent may be consulted; the books in which specifications, law proceedings, and other subjects connected with inventions have been noticed, and such of the specifications of patents granted under the Act 21 of James I. as have been published by the authority of the Commissioners. In addition to these volumes, there are the entire series of specifications and drawings of reaping-machines up to January, 1853, together with Mr. B. Woodcroft's Appendix. The library likewise contains a number of volumes on general scientific subjects, to which others will be added from time to time. Mr. Woodcroft is also collecting, for the same place, a gallery of portraits of great inventors, towards which he has already received several very valuable contributions.

British Workman; and Friend of the Sons of Toil. Partridge, Oakey, and Co., Paternoster-row; Cash, Bishopsgate-street, and Tweedie, Strand.

THE *British Workman* is a cheap illustrated periodical especially devoted to that large and neglected class of British operatives, who lie beyond the reach of the general literature of the day. The conductors evidently seek to arouse the dormant faculties of such persons by plain arguments and forcible appeals, and to direct their sympathies towards habits of providence and morality, bringing before their notice the advantages to be derived from the investment of small sums in savings' banks, friendly societies, clubs, and other similar institutions. The paper is pervaded by a healthy religious air, being free from sectarian bias. The illustrations are exceedingly well executed, and altogether it is a publication which, if widely distributed among the illiterate portions of our working classes, will tend greatly to their improvement.

"A. H.'s" REPLY TO "INDAGATOR."

To the Editor of the Mechanics' Magazine.

SIR,—There is a misprint in my letter which appears in your Number for to-day, by which the illustration as to "war," &c., is rendered complete nonsense, or worse than nonsense. In the second column of page 278, line 8 from the bottom, the words "*good*" and "*evil*" have been transposed by your compositor. *I wrote* the sentence as follows:

"Now it may happen, however, in a particular case, that a certain war does also produce more evil than good, not from the general nature," &c., &c. But your worthy compositor has thought fit to transpose the words, and thus to make sheer nonsense of the whole argument. He must surely be

some relation to that gentleman in "*Paradise Lost*," who exclaims—

"*Evil!* be thou my *Good!*".

This is not the first, nor the second, nor the third time that I have had a similar trick served me by the ingenious gentlemen of the composing tribe. If they would only misprint some indifferent word, one would not care; but I have always noticed that the misprint is sure to be such as to alter the sense, and very often to produce the most absurd results. It was only the other day that I heard the editor of a provincial journal complaining bitterly that a blunder of this sort by the compositors in his own office had made one of his "leading articles" a laughing-stock to the whole neighbourhood.

I am now perfectly willing to believe that everything I have been finding fault with in "Indagator" is to be attributed entirely to Messrs. the Compositors. Men who can make "evil" out of "good" are capable of anything!

Instead, therefore, of supposing (as he begged me to do) that mathematicians are always right, although their statements are wrong, I propose as an amendment on this motion, that the "erroneous statements" be always and invariably ascribed to the *compositors*—a supposition which will answer the same purpose in a more logical way, and get rid of controversies without making the un-mathematical assumptions which are involved in *his* plan.

It is possible that in your next Number there may be a long letter from "Indagator," pointing out in the most unmerciful tone the absurdity of my poor "illustration," and retorting upon me the advice about accurate writing, &c., &c. If the "Miltonic" compositor does not take all this castigation on his own shoulders, I shall set him down as doubly akin to the personage whose office it is to call evil good and good evil.

I am, Sir, yours, &c.,

March 24. A. H.

[We are glad to find our correspondent relieving us of the responsibility of the unfortunate error he points out, and placing it upon those to whom it belongs. It should be understood that the greatest editorial vigilance is insufficient to prevent occasional liberties being taken with "forms." Sometimes an accident, and at others an excess of cleverness, will lead to some curious transposition or emendation, even after they are beyond the reach of the Editor. We think, however, that but few of our readers can have been much puzzled by the error pointed out by "A. H.," as it is pretty transparent.]

REPLY TO "A. H." ON THE MOON'S MOTION.

To the Editor of the Mechanics' Magazine.

Sir,—It is not my intention to trouble you with many words in reply to "A. H." The controversy is merely about words, and certainly must have lost all interest for the generality of your readers. "A. H." has virtually given up his original imputation of error. The fault he found with me was that I stated that principal axes are permanent ones, without reference to the condition that no external force is supposed to act. I showed plainly, by quoting my own words, that this imputation was not founded on fact. He now quotes another passage further on in my letter, on which he grounds an accusation of inaccurate and improper language. According to his own confession, "A. H." had not taken much trouble to make himself acquainted with the matters in dispute; and I feel confident that no one of your readers who did take that trouble had any such misapprehension as "A. H." seems to imagine my language was likely to beget. I repeat again, that the whole question in Mr. Recordon's first letter and my answer to it, was with respect to the moon considered as a sphere; and I am satisfied that had the controversy ended there, no suspicion would have arisen that any *correction* arising from the heterogeneity and spheroidal shape of the moon had been contemplated on the discussion.

But if I had said that, even allowing the moon to be heterogeneous and spheroidal, the earth's attraction produced no effect on the *amount* and uniformity of the moon's rotation about her axis—did not, in a word, affect the *permanence* of the moon's axis in the sense in which that word is understood, I should have been fully justified in this statement by the analogy of the earth's rotation, which is corroborated by the observed facts of the case.

The attraction of the sun and moon on the protuberant matter at the earth's equator, do not, as is proved by a strict investigation, affect the amount and uniformity of her rotation, but produce some motion in the line of intersection of the earth's equator and her orbit, and in the inclination of her axis to the ecliptic. Although the position of the axis in space is subject to some slight motion, the axis itself is no less *permanent* in the received meaning of that term.

Supposing the moon to be under conditions similar to those in which the earth is placed, we may fairly draw similar inferences. And we do accordingly find that the inclination of her axis of rotation, and the intersection of her equator with the

plane of her orbit, are subject to motions of the kind just described, while she moves uniformly round her axis once in a lunation.

I am not about to follow "A. H." into the mazes of logical discussion into which it may suit him well enough to try to decoy me, in order to call off attention from the true subject matter of the dispute, if there be one. I will admit, at once, that in the hurry of writing (for I have not much time to bestow on these discussions, which are really of no great moment), I have made use of the word *conclusion*, instead of *inference;* and I may have used other words in their popular, but not strictly logical meaning; and "A. H." is perfectly welcome to make the most of this inaccuracy, as he is pleased to call it. Sure I am, that the great majority of your readers, for whom I wrote, had no difficulty in comprehending my meaning (which is the main point, after all, in popular discussions of this kind), and that if I, or any one else writing in your pages, were to use expressions and terms in no other than their technical logical meaning, we should seem to all pedantic and absurd, and to many obscure and unintelligible.

However, I have one word to say on this point. The question is about the application of the principle of the permanence of principal axes. I say, that if an external force be such as to produce no moment about the axis in question, it is, as regards the application of this principle, and as contemplated in the general proposition, no external force at all. If this were not so, no body on the earth's surface could have a permanent axis of rotation—at least, in the contemplation of the general proposition; for the earth's attraction—an external force—is always in action; and *therefore*, according to "A.H.," the principle of the permanence of principal axes could never apply.

"A. H." was endeavouring, in a single sentence, to demolish my statement about the moon's axis rotation; and told us that, *because* the earth's attraction is an external force, therefore the principle does not apply. Now his statement here is not of the nature of *general* statements, but merely applicable to a particular case; if, therefore, under any circumstances, the earth's attraction may be such as to produce no moment about her axis, his statement, as it stands, is erroneous; for it is made with respect to a *particular* application of the principle in question.

What logic, or rather what application of logic, that is, which convicts me of error in stating a general principle, although I state it with its full limitation, but which proves "A. H." to be right when he denies that, in a particular case, that principle can apply, although, in some circumstances of that case, it is acknowledged that it nevertheless may and does apply, I leave your readers to judge.

Twice in his former letter "A. H." took especial pains to inform me that the principle I enunciated did not prove its own application to the case of the moon's motion. Now, such inculcation and reiterated inculcation of a self-evident proposition fully justified my remarks, which "A. H." now desires to repudiate; and I cannot help thinking that he held the understanding of your readers somewhat cheap when he thought such very elementary instruction necessary for them.

The truth is that "A. H." and his friends (whoever they be is a matter of no importance; it is a question not of *men*, but of facts) were somewhat too hasty in forming a judgment on my original statement with regard to principal axes; and "A. H." was in too great a hurry in taking my supposed error as a peg to hang his account of D. Bernouilli's lucubrations on the moon's motion upon. That account was in itself good, useful, and seasonable, and required no such apology for its introduction.

One thing is perfectly evident, that between "A. H." and myself there is no real diversity of opinion on this question: it is a mere matter of words; and "A. H." has had an opportunity of making himself merry at my expense. I do not grudge him that satisfaction; for though he may find others to join with him in his laugh (there is never any difficulty in finding plenty of people ready to laugh at or with any one), they would be sorely puzzled to explain what it is they are laughing at.

As I do not take much interest in a mere squabble about words, the facts being agreed on by both parties, I shall take the liberty of retiring from it; and I hereby give notice, that no amount of logical disquisition on the part of "A. H." will tempt me to enter again upon a discussion which has now become flat, stale, and unprofitable.

I am, Sir, yours, &c.,

INDAGATOR.

London, March 27, 1855.

ON THE INDICATED HORSE-POWER OF STEAM ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—"Ingénieur," in your last Number, in reply to my previous letter, states, that "this gentleman" (alluding to myself) "certainly does take a more correct view of the subject than 'Mécanicien,' insomuch that he admits that time, and consequently velocity, have something to do with the

calculation." Now, Sir, I most certainly admit, that in calculating the horse-power of steam-engines, time, and consequently velocity, have something to do with the calculation; but whilst I admit this, *I cannot admit* that, in finding the average pressure upon each inch of the piston of the engine by an indicator diagram, time, and consequently velocity, have anything to do with this part of the calculation. The indicator, so far as the calculation of the horse-power of a steam-engine is concerned, is only used to find the pressure of the steam upon each inch of the piston of the engine, but gives us no idea of the space the piston of the engine passes through in any given time. This is come at independently of the indicator. "Mécanicien" is in error when he says that "the atmospheric line of the diagram represents, at a certain scale, the stroke of the piston in feet and fractions of feet." "Ingénieur" is also in error when he says that "the area of the diagram is simply the length of the stroke multiplied by the average pressure upon the piston." The length of the atmospheric line entirely depends upon the distance the drum of the indicator is made to travel during either each up or down stroke of the piston of the engine, and has no relation to the length of the stroke of the engine. This being the case, I still then maintain, that "*it is a matter of perfect indifference what is the velocity of the piston during any* PORTION *of either the down or up stroke of the piston, since all that is wanted to be known in order to tell exactly the* PRESSURE *upon each inch of the piston, is the area of the figure bounded by the perimeter made by the pencil of the indicator, whilst the piston is making one down and one up stroke.*" From the above sentence "Ingénieur" draws the following inference, viz., "Since the velocity of the piston does not show the pressure upon the piston, it is perfectly immaterial with regard to the power transmitted, whether the engine makes four or twenty-four strokes per minute. In reply to this inference I would simply ask "Ingénieur," would it not have been more logical and more to the point if he had said, that *since the area of the diagram, divided by the length of the atmospheric line in the scale of the indicator, only gives the* AVERAGE PRESSURE *of steam upon each inch of the piston, it is perfectly immaterial, in taking an indicator diagram for the purpose of calculating the horse-power, whether the engine makes four or twenty-four strokes per minute.* My object in writing to you has been to point out that the varying motion of the piston from bottom to top, or from top to bottom, can be no source of error in getting by an indicator diagram the average *pressure* of steam upon each inch of the piston of the engine. And further, if the area of the diagram be known exactly, the average pressure upon each inch of the piston would be found exactly and easily. Whether I have accomplished these two objects or not, I leave you and your scientific and talented correspondents to decide. I will merely add in conclusion, that truth and not victory is my object in carrying on this or any other controversy; and if I have been guilty of writing at random, or in a manner not intelligible, I am entirely unacquainted with the fact, except that "Ingénieur" chooses to say so. But, Sir, I have my *misgivings* that "Ingénieur" is writing for victory, and is determined to have it at any cost, else he never would attempt to pass off for argument such reckless assertions to refute his opponents as are to be found in his last letter.

I am, Sir, yours, &c.,

JAMES EMMETT.

Burnley, March 21, 1855.

REPLY TO MR. MUSHET ON THE SMOKE QUESTION.*

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Mushet, in his observations on my letter (No. 1647, page 204), has arrived at conclusions which are certainly not authorized by my remarks. A glance at my letter will show that my allusions were merely in reference to the *principle of combustion*, and not to the *application of heat.* The overwhelming attack which Mr. Mushet has made against a "preposterous smoke consumer," is quite inapplicable to any notion of my own, for the astounding project of employing "a costly plant and two extra fires" has figured no where but in the fertile imagination of your correspondent.

With your permission, I will put in another form my idea of what smoke really is, although I fear the generality of your readers will be tired of this sooty subject.

The chimney of a furnace in which coal is *imperfectly* burned, vomits into the atmosphere a dark cloud, composed principally of carbonaceous matter, carbonic acid, and the vapour of water (not to mention nitrogen, carbonic oxide, &c., &c.) If the same furnace were supplied with coke, there would be no *visible* emanations from the chimney, but the atmosphere would be no less contaminated by a constant stream of *invisible* deleterious gases.

In the first case the chimney is *said to smoke;* in the latter, *not to smoke.* Surely

* If our correspondents wish us to publish any additional letters on the subject of this or the following letter, their communications must be very brief.—ED.

this stubborn fact will not be denied! The appearance of smoke, therefore, is due to the presence of carbonaceous matter and nothing else; and when people talk of burning smoke, they certainly do not commit an absurdity, because this carbonaceous matter is combustible, and, therefore, capable of being burned.

It must not be inferred from what precedes that I am an advocate for any smoke-consuming scheme. The old adage is applicable here: "Prevention is better than cure." Only let a *perfect* combustion be aimed at—and it may be attained equally with *hot* or with *cold air*—and then not only will the smoke nuisance be abated, but a wasteful use of fuel will be prevented.

Mr. Mushet appears anxious to impress on the mind of your readers that I do not perceive the difference between *gas* and *smoke*. I imagine the difference to be this: the first is a permanently elastic fluid (under the ordinary pressure and temperature), while the latter owes its appearance to solid carbonaceous matter and condensable tarry vapour, floating in the gases which escape from burning coal.

Mr. Mushet says that it is singular not to perceive the correct distinction between coal "gas *before it is consumed*, and the vapour, or *true* smoke, which ensues after it has been *imperfectly* consumed." The very use of the word, *imperfectly*, indicates that something has been left undone, and certainly such is the case, for there remains to be burned the combustible matter, or carbon of the smoke, which has escaped in consequence of the fuel having been improperly treated.

Before leaving this smoke question, I must confess my inability to comprehend Mr. Mushet's theory of "carbonaceous particles, or *soot*, liberated from the *hydrogen which is decomposed*." What are the elements of hydrogen? Your correspondent will not object to this question, since he has gratuitously informed me that water results from the combustion of hydrogen.

Mr. Mushet's reasoning to attempt to prove that I make a "singular oversight" in stating that the flame of a candle may be almost extinguished by supplying it with intensely cold air,* falls to the ground before the fact, that the same phenomenon occurs with an Argand gas flame (where it is not requisite "to melt the liquid fuel"). The flame in both cases is diminished in size, but increased (not "diminished") in brightness.

In the last paragraph of Mr. Mushet's letter, he appears to imagine that he has administered the *coup de grace*—that I have given the most conclusive of all "cases against the hot-air quackery;" that I have "settled the hot-air ambiguity," &c. I must distinctly disclaim having espoused any sort of "mistake," "quackery," or "ambiguity" of this kind. I merely persist in stating a fact, that a given quantity of fuel supplied with cold air will realise a certain effect, while the same quantity of combustible supplied with hot air will produce a *greater* effect. If people will apply this principle erroneously and obtain a contrary result, do not let them declare the principle to be wrong.

It is a strange mode of reasoning to say, the bars of Jukes's grate *must* be kept *as cold as possible*, to preserve the links, &c., from distortion; *therefore*, cold air is more conducive to the combustion of smoke than hot air! and yet Mr. Mushet arrives at that conclusion by such reasoning.

The fact thus pounced upon by Mr. Mushet is conclusive in favour of my remarks on hot air; for if hot air were supplied to Jukes's grate, your correspondent is aware that the bars would bend or melt. This effect would result from a *greater heat* being generated than when cold air is supplied to the furnace.

I am, Sir, yours, &c.,
G. H. PALMER.

Marseilles, March 17, 1855.

* When I mention *intense cold*, I allude to the lowest range of temperature which can be artificially produced, and not the cold of a winter's night in our latitude.

PARKER'S PATENT SMOKE-CONSUMING APPARATUS.

"Look on this picture, and on that."

To the Editor of the Mechanics' Magazine.

SIR,—As Mr. Williams, in his last communication, at page 256, again represents Mr. Parker's patent smoke-consuming apparatus to be identical with that shown at fig. 39 of Mr. Williams's work on Combustion, I must request your insertion thereof, with the following descriptive extract, leaving your readers to draw their own conclusions as to the identity between them and the apparatus shown at page 444 of your last volume, merely remarking that, although Mr. Williams's *experiment* was *successful*, so far as the prevention of smoke was concerned, it was *practically a failure*, from the rapid derangement of the apparatus, the apertures becoming clogged with particles of sand, coals, and ashes, and the apparatus exposed to the destructive action of the fire; defects from which Mr. Parker's air-distributors are comparatively free.

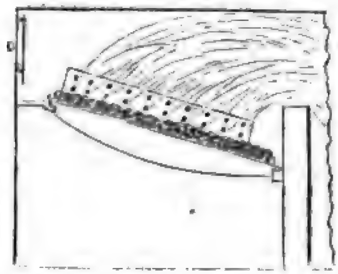
I am, Sir, yours, &c.,
W. BADDELEY.

13, Angell-terrace, Islington,
March 19, 1855.

"The main object being the introducing the air in a divided state to the gaseous

atmosphere of the furnace-chamber, *the following experiment was made:* the centre bar of a boiler, four feet long, was taken out, and over the vacant space an iron plate was introduced, bent in the form as shown in fig. 39.* Here the upper portion of the

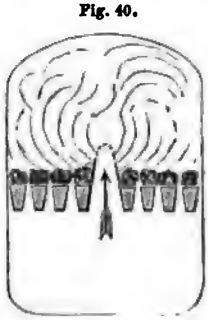
Fig. 39.



bent plate, projecting three inches above the fuel, was punched with five rows of half-inch holes, through which the air issued in 56 streams. Adequate mixture was thus instantly obtained, as in the Argand gas-burner.

"The sectional view of the furnace, looked at from behind, as in fig. 40, repre-

Fig. 40.



sents the character and diffusive action of the flame."†

WATER BALLAST-BAGS.

To the Editor of the Mechanics' Magazine.

SIR,—In your notice of the discussion that took place the other day, on the reading of Mr. Allen's paper, "On Steam and Sailing Colliers," I observe it stated that "the bag-ballast is admitted to be convenient in some cases, but it was better adapted for long than for short voyages, and the wear and tear was a considerable item of expense." It was also stated in another part of the discussion that the duration of the bags was only nine months, as found by the trial of them in the ship *Northumberland.* Now, what I wish to remark is, that this ship was one of the first that tried the ballast-bags, and that since then the patentee has so entirely altered the process of rendering the bags waterproof as to require his taking a new patent; and that, therefore, the duration of the bags is not yet known; but that there is at present a vessel running which has had the bags for above one year, and that they are still in good order. From this, I think, it must be seen to be unfair to judge as yet of the duration of the bags. May I beg of you to give a place to these few remarks, as I know your pages are always open to fair play.

I am, Sir, yours, &c.,

A CONSTANT READER.

Newcastle, March 21, 1855.

MANUMOTIVE CARRIAGES.

To the Editor of the Mechanics' Magazine.

SIR,—A poor invalid, who has lost the use of his limbs, though not entirely that of his arms, would esteem it a great favour if any of your correspondents would inform him, if possible, through your very useful Magazine, how the simplest and best contrivance is made, by which he, himself, could propel his chaise. I am, Sir, yours, &c.,

CHARLES GIBBONS.

31, Harcourt-street, Bryanstone-square.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

YOUNG, JAMES HADDEN, of Great College-street, Camden-town. *Improvements in the construction of railways.* Patent dated August 23, 1854. (No. 1852.)

The inventor proposes to employ rods or rails, kept in a state of tension by being stretched over posts, sleepers, or other fixtures, according to the inequalities of the ground for carriages to run upon.

*** The above abstract should have appeared on page 258 of No. 1649.

PARKER, JAMES, of Birmingham, Warwick, locomotive superintendent. *An improvement or improvements in the smoke-boxes of locomotive engines.* Patent dated September 4, 1854. (No. 1927.)

This invention consists in constructing the smoke-boxes of locomotive engines with movable or opening bottoms, and connecting with the latter mechanism to enable the driver to open them, either for allowing the contents to fall out or for regulating the draught, and to close them again while the driver is on the engine, and the engine is in motion.

MILLER, GEORGE MACKAY, of Inchicore, Dublin, civil engineer. *Improvements in*

* The above figures have been reduced from those given in Mr. Williams's work.—ED.

† "Williams on Combustion," p. 92.

axle-boxes and parts working in connection with axles of carriages and other vehicles in use upon railways. Patent dated September 4, 1854. (No. 1928.)

Claims—1. The form and arrangement of a certain upper grease chamber extending along the under face of the step or bearing, either separate or in conjunction with the ordinary hole or holes and passages, together with a particular form of step and a guard at the back of the axle-box. 2. The application of a hinge to the cap covering the grease-hopper at the front of the axle-box, and retaining it in its position when closed by springs. 3. The application at the back of the axle-box of two or more flat pieces of material capable of sliding vertically or laterally past each other by the action of screws or springs. 4. The introduction between the boss or nave of the wheel and the axle of a cylinder or box free to revolve on the axle, and on which the wheel is secured.

White, John Lockhart and Henry Henderson, plumbers, and James Couper, senior, earthenware manufacturer, all of Glasgow, Lanark. *Improvements in water-closets.* Patent dated September 4, 1854. (No. 1929.)

This invention consists in manufacturing the ordinary pans or basins and valves in water-closets of glass.

Hill, William, of Congleton, Chester, hatter. *Certain improvements in doubling or twisting net or raw silks.* Patent dated September 4, 1854. (No. 1930.)

Claim. — The application, employment, and use of a traversing medium, as a movable carriage or creel, such as is used in the mule or jenny employed in cotton manufacture, (and whether self-acting or otherwise), for the purposes of doubling or twisting net or raw silks.

Lavaur, Jacques François Henry Hippolite Herve de. *Certain improvements in securing waterproof wrappers or coverings used in packing goods.* Patent dated September 4, 1854. (No. 1936.)

This invention mainly consists in lining water-proof wrappers with a lining made of paper, cloth, or canvas, covered with one of the following compositions:—*First composition.* Four ounces troy of resin. Five ditto of bitumen. One ditto of gutta percha. Eight ditto of talc. *Second composition.* One ounce troy of bitumen. One quarter of an ounce ditto of gutta percha, and one tenth of an ounce of chloride of calcium dissolved in water.

Brownfoot, William, of Leeds, York, cabinet-maker and upholsterer. *A new or improved instrument or apparatus for raising, lowering, and adjusting Venetian blinds.* Patent dated September 5, 1854. (No. 1937.)

This invention consists in raising, lowering, and adjusting Venetian blinds, by causing a ratchet-wheel placed on the axis of the pullies over which the cords pass, to engage with a pall or click, whereby, when the motion of the said pullies is arrested, the cords are pressed against the pullies to prevent their slipping, the pall or click being capable of being disengaged from the ratchet-wheel by the pulling of a cord, or otherwise.

Stocker, Samuel, of Brighton, Sussex. *Certain coverings for various parts of the human body, with a view to the preservation of health.* Patent dated September 5, 1854. (No. 1940.)

This invention comprises the preparation of various forms of lung-protectors; the construction of coverings for the head, which envelop the face, and are furnished with apertures for the eyes; the formation of certain mouth-protectors; the use of certain coverings for the head and shoulders; the perforation of India-rubber or other water-proof shoes, and the filling up of the perforations, with threads or strips of woollen or other suitable materials; and making the external and upper parts of clogs of paper made impervious to the wet, a heel-piece and subsole of wood, leather, or other suitable material being fixed to these uppers.

Pape, John Henry, of Paris, France, Rue des Bons Enfants. *Improvements in wind musical instruments.* Patent dated September 5, 1854. (No. 1942.)

In the inventor's improved instruments various kinds of metal reeds and tongues are employed to produce a variety of tones.

Trimble, Isaac Pym, of New York, United States, doctor of medicine. *Improvements in regulating the temperature in conservatories and other apartments, or in ventilating the same.* Patent dated September 5, 1854. (No. 1943.)

This invention consists in working ventilating and regulating valves by the application of the forces derived from the expansion and contraction of metal bars, &c.

Eden, James, of Lytham, Lancaster, bleacher. *Improvements in apparatus for drying fabrics.* Patent dated September 6, 1854. (No. 1945.)

The inventor employs, in connection with stoves, an apparatus which consists of a series of rollers that conduct a web of the fabric to be dried through the stove, and that, whilst the fabric is in the stove, cause it to pass over and near to the heated surfaces.

Westwood, Joseph, of Poplar, Middlesex, iron-ship builder, and Robert Baillie, also of Poplar, Middlesex, iron-ship builder. *A method of protecting iron ships and vessels*

from corrosion and animal and vegetable matters. Patent dated September 6, 1854. (No. 1947.)

This invention consists in the method of applying preservative compositions both internally and externally to the plates and other parts of which iron ships and vessels are constructed. Asphalte and bituminous varnishes are known to form good preservative coatings, but it has hitherto been found impracticable to cause them to adhere to the metal. The inventors therefore first lay on a layer or coating of black varnish, and then a layer of asphalte, or a coating of boiled oil and black lead, and black varnish, or of black varnish, asphalte, and spirits of naphtha.

GARNAUD, PAUL ADOLPHE, of Paris, France. *Improvements in certain gazogene apparatus used for the production of aërated liquids.* Patent dated September 7, 1854. (No. 1951.)

This invention applies to those gazogene apparatus in which the waters or liquids are aërated by their action upon acids and alkalis, such as tartaric acid and bi-carbonate of soda, &c., and consists in lodging in the lower or gas generating portion of such apparatus a receiver for holding the acid used in aërating.

LUND, HENRY, of the Temple, esquire. *Improvements in propelling and steering vessels, and in the steam engine applied to these purposes.* Patent dated September 7, 1854. (No. 1953.)

This invention consists in an arrangement of engines to be employed in driving the patentee's rowing propellers which were the subject of a former patent.

ADAMS, ROBERT, of King William-street, London. *Improvements in breech-loading fire-arms.* (A communication.) Patent dated September 6, 1854. (No. 1954.)

Claim.—Constructing and arranging a breech-loading fire-arm in such manner that the escape of the gases at the breech is prevented by a ball in the rear of the charge, which is forced by the explosion against the closing plug of the breech.

BURNS, JAMES, of Manchester, Lancashire. *Improvements in ventilating ships.* Patent dated September 8, 1854. (No. 1956.)

Claim.—The application of the rising and falling of the waves to the forcing of fresh air from the outside to the lower and other parts of the interior of ships.

YOUIL, JOHN, of Burton-upon-Trent, Stafford, common brewer. *Improvements in the mode or method of fermenting liquors, and in the machinery or apparatus employed therein.* Patent dated September 8, 1854. (No. 1957.)

This invention relates to improved modes of fermenting malt liquors in closed or air-tight vessels, which exclude the atmospheric air from the wort during the process of fermentation, and at the same time allowing the escape of the carbonic acid gas.

JONES, JOHN, of Westfield-terrace, Sheffield, York, manufacturer. *Improvements in metal dinner and dessert-forks.* Patent dated September 8, 1854. (No. 1958.)

This invention consists in forming forks with short prongs above which is a space of a spoon form, so that the article may be used both as a fork and as a spoon.

FREARSON, SAMUEL, of Glascote, Warwick, gentleman. *Improvements in the construction and manufacture of buttons, a part or parts of which improvements may also be applied to other similar purposes.* (A communication.) Patent dated September 8, 1854. (No. 1959.)

This invention relates principally to perforated buttons which are made wholly or partly of metal, and consists—1. In giving new or improved forms to such buttons; and 2. In forming certain tools to be used in the manufacture of them.

PETITJEAN, TONY, of Upper John-street, Fitzroy-square, Middlesex. *An improved process for recutting or reforming the faces of files.* Patent dated September 8, 1854. (No. 1960.)

The inventor's method of recutting files, consists in the employment of galvanic action for that purpose, and depends on "the fact that the dissolving action of the positive pole of a galvanic battery first takes place in the hollows."

SHARP, WILLIAM PRIOR, and WILLIAM WEILD, of Manchester, Lancaster, machinists. *Improvements in the production of raw and thrown silk, and in machinery and apparatus to be used for that purpose.* Patent dated September 8, 1854. (No. 1963.)

This invention mainly consists in the use in cocoon reeling machines of cloth covered clearers, metallic edges, revolving tubes through which the filaments of the cocoons are passed, separate reels or swifts for each hank or skein, certain combs or pincing instruments, and hank or skein transferring apparatus.

RAMSBOTHAM, HENRY ROBERT, of Bradford, York, worsted spinner, and WILLIAM BROWN, of the same place, mechanic. *Improvements in preparing to be spun cotton, wool, hair, and other fibrous materials.* Patent dated September 8, 1854. (No. 1969.)

These improvements relate,—1. To the arranging of receiving combs used in combing fibrous substances, so that the back rows of teeth extend above the others, with their points inclining forwards over those in front of them.—2. To certain improvements upon the apparatus, patented by Ross,

May 6, 1837, and July 18, 1838.—3. To the application to ordinary receiving combs of an additional comb, called a "catch comb," and which, when fibre is being laid on to the receiving comb, is made to stand above the level of the points of the teeth of the latter and behind it, so that when the fibre is coming into position to be filled on to the receiving comb this "catch comb" catches hold of it first and then descends with it till (or till just before) the fibre is taken hold of by the receiving comb, when the "catch comb" retires out of the way, and the noil is taken to the back of the combs.

GUYARDIN, ACHILLE, of Paris, France. *The use of a certain fibrous matter for the manufacture of paper and pasteboard.* Patent dated September 9, 1854. (No. 1970.)

Claim.—The application of the "arrow," or "water-arrow" plant of Britany, to the manufacture of paper, pasteboard, &c.

HACKWORTH, JOHN WESLEY, of Priestgate Engine-works, Darlington, Durham, engineer. *Improvements in steam engines, and in gearing connected therewith.* Patent dated September 9, 1854. (No. 1971.)

This invention relates to various modifications of the general details of steam engines, which we shall probably give hereafter, especially intended for stationary and marine purposes, with the object of securing superior efficiency of working action.

CLOWES, THOMAS, of Beverley, York, saddler. *Improvements in muzzles for horses, or apparatus to prevent horses from biting or sucking their cribs or mangers.* Patent dated September 9, 1854. (No 1974.)

Claim.—The use of prickers, or sharp-pointed instruments, in combination with springs and a perforated shield, plate, bar, or bars, attached to the muzzles of horses.

JACKSON, PETER ROTHWELL, of Salford, Lancaster, engineer. *Improvements in the manufacture of wheels.* Patent dated September 11, 1854. (No. 1975.)

In carrying out this invention, the heated iron, after having been placed in a suitable mould or die, is forced into the shape of the mould, and through grooves or channels radiating therefrom so as to form spokes, in some cases bent at their outer ends, making a continuation of each spoke form a portion of the felloe of the wheel.

RIGBY, JOHN, of Dublin, gun-maker. *Improvements in fire-arms and guns, and in waddings to be used therewith.* Patent dated September 11, 1854. (No. 1976.)

Claims.—1. A safety-catch for retaining the cock, with the means of liberating the latter independently of the lock or trigger. 2. A mode of uniting two or more safety-barrels so that they may be separated and rejoined at will. 3. A certain mode of rifling gun-barrels in such manner that, in the cross section, they shall resemble two semicircles, having a common diametral line, but centres a little removed from each other. 4. A method of making compound rifle patches of a felt wad, fixed on a patch of calico or linen. 5. A loading lever, so fixed as to be capable of passing into the loading-chamber, and ramming the charge without any especial adjustment of the chamber.

PALMER, EDWARD, of Southampton. *Improvements in propelling vessels.* Patent dated September 11, 1854. (No. 1977.)

This invention consists in so constructing the frames to which propellers are attached, that the blades may be removed without difficulty, and offer facilities for appplying more or less of them as required. For this purpose the radial stays are made with grooves, and the blades, which are of the form of a portion of a circle, are attached to them by movable fastenings.

NORTON, JOHN, of Cork, Ireland, Esq. *Improvements in the manufacture of ropes, bands, and cordage.* Patent dated September 11, 1854. (No. 1978.)

This invention mainly consists in a mode of manufacturing ropes, bands, and cordage, by cementing together parallel, or very slightly twisted minor strands.

SZONTAGH, SAMUEL, of Paris, France. *Improvements in sewing-machines.* Patent dated September 11, 1854. (No. 1980.)

The inventor claims a certain improved form of needle, and the application of a magnet to the shuttle-box of sewing-machines for keeping the shuttle in close contact with that part of the shuttle-box against which it slides.

PURNELLE, JOHN CHILLCOTT, of Tachbrook-street, Pimlico, Middlesex. *Improvements in obtaining and applying motive power.* Patent dated September 11, 1854. (No. 1981.)

This invention consists in a certain arrangement of apparatus to be worked by hydraulic pressure for obtaining motive power, the object being to render hydraulic machines more portable than heretofore.

BILLING, MARTIN, of Birmingham, Warwick, manufacturer. *Improvements in manufacturing and ornamenting castors for furniture.* Patent dated September 12, 1854. (No. 1982.)

This invention consists in covering wheels made of cast iron with a casing of sheet brass, or other metal or alloy, whether the said casing or covering be plain or ornamental.

GILLMAN, EDWARD, of Twickenham, Middlesex, gentleman. *Obtaining filaments from certain vegetable substances, and applying the same to various manufacturing pur-*

poses. Patent dated September 12, 1854. (No. 1983.)

This invention consists in obtaining filaments from the fibrous parts of the New Zealand plants, called "giagia" and "ti," and in applying the same to various manufacturing purposes.

NASH, WILLIAM, of Islington, builder, and JOHN JEWELL, of the same place, Middlesex, cabinet maker. *Improvements in window-sashes and frames.* Patent dated September 13, 1854. (No. 1988.)

In carrying out this invention the two sashes of a window have side-springs, or a double ratchet and pinion passed between their beads on each side of the frame, and a portion of the frame, sufficient to allow the sashes to move about centres when opposite each other, is made movable, so that the sashes may be partly rotated, and have their outsides made accessible for cleaning, &c., from within. By the same arrangement balance weights may be dispensed with.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London, patent agent. *Improvements in electro-magnetic clocks.* (A communication.) Patent dated September 13, 1854. (No. 1990.)

The inventor describes a system of electric clocks, each of which is worked by independent mechanism.

CROSLEY, HENRY, of Camberwell-grove, Surrey. *Improvements in the manufacture of paper, millboard, and felt from materials not hitherto so used.* Patent dated September 13, 1854. (No. 1994.)

In an invention patented by Mr. Crosley, April 15, 1839, tan and hops alone were used for the purposes named in the title, and the present invention consists in preparing spent tan and spent hops, and in then mixing them with animal or vegetable fibre.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

FISH, JOHN, of Livesey, near Blackburn, Lancaster, and JOHN THOMPSON, of Witton, near Blackburn, aforesaid. *Improvements in the mode or method of picking warps.* Application dated September 4, 1854. (No. 1926.)

Instead of the usual method of leasing the warps at the sizing machine, the inventors propose to make a reed or wraith about half the width of the usual reed, with one side loose, so that it will slide on and off a peg or slide at each end. This half reed or wraith will resemble a long rod with fine teeth similar to a comb, and is put on the warp when it is on the bowl of the sizing machine, the teeth or comb separating the warp-threads. The inventors then put on the loose side or rod at the other side of the warp-threads, thus forming a complete reed, which they allow to remain, and doff the warp with it on, so that it is ready for looming without the trouble of leasing.

ROWLAND, ELLIS, and JAMES ROWLAND, of Manchester, Lancaster, engineers. *Improvements in coupling or connecting links for railway carriages or other such purposes.* Application dated September 4, 1854. (No. 1931.)

The inventors propose to employ a cylindrical chamber filled with oil or other liquid, having a connecting channel on its upper side running from one end of the chamber to the other, and being furnished at one end with a valve opening inwards. The ends of the chamber are each rendered tight by stuffing-boxes, through which run connecting rods, at one end of each of which the carriages are secured.

MITCHEL, WILLIAM HASLETT, of Brooklyn, New York, United States of America. *Improvements in means for distributing type.* Application dated September 4, 1854. (No. 1932.)

The inventor causes to be propelled backward and forward on slides a follower on which is a hook that is connected or disconnected from a shuttle, so that the latter is left stationary when required, while the follower completes its motion.

MAYER, SAMUEL, of Bristol, and WILLIAM BUSH, also of Bristol, millwright. *Improvements in reducing flints and other substances, rendering them suitable for the manufacture of porcelain and other earthenware articles.* Application dated September 4, 1854. (No. 1933.)

The materials are ground, and then placed in a hopper and passed through mill-stones which have cavities cut therein, into which the powdered materials enter during the revolution of the mill-stones, and there is a constant stream of water which enters with the powder on the under side of the hopper, mixing with the powdered materials, and passing through the mill-stones.

SKIDMORE, FRANCIS ALFRED, of Coventry, and JOSEPH BOLTON, of the same place, metal workers. *Improvements in the manufacture of cast-iron pipes.* Application dated September 4, 1854. (No. 1934.)

These improvements consist in casting pipes with screws on their ends. The inventors introduce a washer of gutta percha or other suitable material at the end of the screws before the pipes are screwed together.

SLOUGHGROVE, JOHN WILLIAM, and

JAMES HENRY WHEATLEY, of Windsor-street, Islington, engineers. *Improvements in furnaces and ovens to promote the consumption of smoke.* Application dated September 4, 1854. (No. 1935.)

The improved furnace is fitted with two sets of fire bars placed behind each other; between them is a space in which is worked a movable screen or bridge made of two perforated metal plates, the sides and top of it being closed, and the bottom left open to admit a current of air between the plates.

FAUVELLE, FRANÇOIS XAVIER ALEXIS, merchant, of Paris, France. *Certain improvements in cleaning dressing-combs.* (A communication.) Application dated September 5th, 1854. (No. 1938.)

The inventor constructs an instrument composed of a number of parallel wires or threads tightly stretched on a suitable support.

TRAPPES, HENRY, of Manchester, Lancaster, gentleman. *A process for the preparation of leather to be used in the manufacture of a new flock, and for the manufacture of the same; to be used and applied in lieu of flock made from pounded or ground wool and woollen materials, heretofore commonly used in the manufacture of painted, printed, and dyed decorating papers, carpets, oil-cloths, and other things; and also to be used as a paste or pulp for the manufacture of all kinds of paper, parchment, and pasteboard, of toys, of ornamental and other picture-frames, of mouldings, architectural and sculptural ornaments, and other things.* (A communication.) Application dated September 5, 1854. (No. 1939.)

This invention consists in grinding leather by means of millstones, and in subjecting it to certain washing, sifting, additional grinding, and bleaching processes, &c.

BARNES, WILLIAM, of Royal Exchange-buildings, London. *Improvements in fastening rails of railways.* Application dated September 5, 1854. (No. 1941.)

This invention consists in fastening the rails of railways "by the use of plugs inserted into their ends."

PAPE, JOHN HENRY, of Paris, Rue des Bons Enfants. *Improvements in pianofortes.* Application dated September 5, 1854. (No. 1944.)

This invention consists in employing certain forks, or instruments resembling forks, in combination with the ordinary strings.

NEWBOULD, WILLIAM, of Derby, draper. *Improvements in the manufacture of busks for stays.* Application dated September 6, 1854. (No. 1946.)

The inventor employs certain steel racks, each of which is divided into two equal parts which are made semicircular, and the inner parts of which are connected on the outer edge by means of an elastic, which serves to pull the edges towards each other and keep the stays fastened.

CALVERT, EDMUND, of Walton-le-dale, Lancaster, spinner and manufacturer, and WILLIAM MITCHELL, of the same place, overlooker. *Certain improvements in looms for weaving.* Application dated September 7, 1854. (No. 1949.)

This invention consists in an improved combination of parts for checking the momentum of the shuttle when it enters the shuttle-box, and for checking the picker when the shuttle has been picked. These objects are effected by means of a short check-strap connected to each shuttle-box.

WHEELER, GEORGE PRINTY, paper-maker, of Bellevue-place, Cleveland-street, Mile-end-road, and SAMUEL BROMHEAD, gentleman, of Holford-square, Pentonville. *The production of new fibrous materials capable of and suited for the manufacturing of string, rope, matting, and various fabrics, with or without the combination of cotton, wool, or flax, or for pulp for the manufacturing of paper, papier-maché, millboard, &c.* Application dated September 7, 1854. (No. 1950.)

The inventors make use of "plants of the species called 'iris' or the flower-de-luce, or flags, or leaves of flags of every description known by botanists as a genus of plants of the class triandria, and order monogynia."

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in coating iron and steel wire with other metals or alloys.* (A communication.) Application dated September 7, 1854. (No. 1952.)

In carrying out this invention, the wires to be coated are wound upon vertical reels, placed at one extremity of the machine, and from these they pass through a double vessel, one portion of which contains a solution of double chloride of zinc and ammonia, while the other serves to receive any acid which may drop from the wires after immersion, and during their passage through certain cushions attached to the vessel, from which cushions they proceed to the metal bath of zinc or tin, contained in a vessel placed immediately over a furnace. On leaving this bath the wires are entirely coated with metal, and are then passed through two steel gauge plates, by which they are smoothed, and are then instantly cooled by means of jets of cold water.

MANIFOLD, JOHN THORNBORROW, and CHARLES SPENCER LOWNDES, of Liverpool, Lancaster, engineers. *Improvements in windlass fittings.* Application dated September 8, 1854. (No. 1955.)

These improvements relate to fittings

applicable to windlasses for facilitating the operations of lifting and lowering ships' anchors and chain cables, and consist in the employment of a certain circular grooved and notched catch attached to the windlass barrel, and of a bed-plate furnished with guides to guide the links, and with stoppers to stop them.

MACALLISTER, ROBERT, of Glasgow, Lanark, pattern-maker. *An improvement in fitting or applying screw-propellers to ships and vessels* Application dated September 8, 1854. (No. 1962.)

A full description of this invention will be given shortly.

TRAVIS, EDWIN, of Oldham, Lancaster, cotton-spinner. *Improvements in apparatus for measuring water and other fluids.* Application dated September 8, 1854. (No. 1964.)

These improvements consist in the employment of a slide valve cylinder and piston, like those employed in steam engines, so arranged in connection with other suitable apparatus as to register the quantity of fluid which passed through the cylinder.

ATHERTON, JAMES, of Preston, Lancaster, machine-maker, JOHN KINLOCK, of the same place, manager, and JOHN SWAINSON, junior, of the same place, worsted manufacturer. *Improvements in machinery or apparatus for sizeing or dressing yarns or threads.* Application dated September 8, 1854. (No. 1965.)

This invention relates to various modifications of the "tape-sizeing machine" ordinarily used for sizeing or dressing yarns. In these new arrangements the squeezing-rollers are not actuated simply by the tensional action of the yarn or threads under treatment, but are driven by gearing.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture of boots and shoes, or other coverings for the feet.* Application dated September 8, 1854. (No. 1966.)

This invention consists of an arrangement of machinery for effecting the turning in of the edge of that part of the leather which forms the "tread" of boots, shoes, &c.

HUSTWAYTE, BENJAMIN, of Hockley-street, Homerton, Middlesex, bricklayer. *An improved construction of metal roofing.* Application dated September 8, 1854. (No. 1968.)

The inventor employs zinc or galvanized iron plates, by preference of the size of ordinary slates, and screws them to the battens or boards of the roof by means of copper or galvanized iron screws or nails, passing these fastenings through the heads only of the plates.

BOWLER, WILLIAM, of Southwark-bridge-road, Surrey, hat-manufacturer. *Improvements in hats and other coverings for the head.* Application dated September 9, 1854. (No. 1972.)

This invention relates to ventilating hats, &c., and consists in combining with outlet-apertures for the air at the top of the hat, as ordinarily used, a means of admitting fresh air between the hat-leather and the inside of the hat-body.

HODSON, THOMAS, of Manchester, Lancaster, overlooker. *Certain improvements in machinery or apparatus for doubling yarn or thread.* Application dated September 9, 1854. (No. 1973.)

These improvements relate to doubling frames, and consist in employing a bent lever, furnished with certain appendages, so arranged that when the yarn breaks, the end of the lever is released, and, by means of a counterbalance weight, the top roller is thrown up, and waste is prevented; in employing, in place of thread wires, a perforated plate, having a diagonal slot at each perforation; in using, at the head of a flyer, a curved and regular edge to prevent breakage; in regulating the bobbin by means of a screw and nut; and in steadying the bolster by means of a collar or flange.

WORRALL, JAMES, of Salford, Lancaster, dyer and finisher. *Improvements in the method of treating and printing such fustian goods or fabrics as are called "cords," and "thicksets" or "velveteens."* Application dated September 11, 1854. (No. 1979.)

This invention consists simply in printing the articles named in the title immediately after the process of "cutting" them.

LAMING, RICHARD, of Carlton Villas, Maida Vale, Middlesex. *Improvements in purifying gas from ammonia and other impurities, and preparing pure gas for burning, in obtaining ammonia and certain salts of ammonia and soda, and in treating certain salts of ammonia.* Application dated September 12, 1854. (No. 1984.)

This invention relates,—1. To a method of removing bad and supplying good odours to gas.—2. To a process for obtaining, at a cheap rate, ammonia sufficiently free from hydrosulphuric acid for the above purpose, the said process simultaneously yielding carbonate of soda. This process consists in heating a mixture of a carbonate of ammonia and sulphuret of sodium with or without oxide of iron or other cheap oxide, according to the nature of the carbonate of ammonia which is used, or in heating a mixture of sulphuret of ammonium or of sodium and a suitable oxide.—3. To the use of a rotating sieve for distributing more equally the purifying liquids in gas purifiers.—4. To the preparing of certain salts of ammonia for the market, by submitting

a high temperature in their purifi-
(instead of using costly chemical
ts) and consolidating them by the
ion of mechanical pressure.

EWOOD, EDMUND, and GEORGE
s, of Enfield. *Improvements in baths
tacles for melting and containing cer-
tals for the purpose of coating other*
Application dated September 12,
(No. 1986.)

invention consists in making pits
tacles (for containing the metals to
ed and to be kept in a molten state)
k or other suitable materials, and in
in or against the walls, or in the
ions of the pits, flues, or close fire-
or fire-pots, the tops of these, if in
idation, and the sides if in the walls,
n contact with the metal and giving
requisite heat, the fire-places and
ing independent.

LIAMS, JOSEPH, of Liverpool, Lan-
engineer. *Improvements in propellers.*
ation dated September 12, 1854.
87.)

Williams's improved propeller con-
the two broad flat blades, having on
uter ends a slight curve extending
rds. These blades are constructed
suitable boss, near which they par-
ghtly of the screw form.

The documents of Nos. 1946, 1961,
67 are still with the law officers
objection.

)VISIONAL PROTECTIONS.

Dated February 17, 1855.

Henry Philip Haughton, of Bethnal-green,
ex, clerk. Improvements in a certain
f wearing apparel for the ankles.

Dated February 20, 1855.

Frederick Blacket Edward Beaumont, of
Woodhall, Barnsley, York, Lieutenant,
Engineers. Improvements in fire-arms,
volvers.

Dated March 1, 1855.

John Ramsbottom, of Accrington, Lan-
ngineer. Improvements in steam engines,
ining motive power more economically.

Dated March 5, 1855.

ohn Gledhill, of Congleton, Cheshire,
joiner, and Robert Gledhill, of Halifax,
mechanic. Improvements in the prepara-
ilk, flax, and other fibrous substances, and
achinery or apparatus employed therein,
which is applicable to the preparing of
combing.

William Johnson, of Lincoln's-inn-fields,
ex, civil engineer. Improvements in coat-
and steel wire with other metals or alloys.
unication from Alexandre Désiré Eugene
and Adrien Muller.

Andrew Hotchkiss, of New York, United
f America. Improvements in projectiles.

Antoine Louis Garnier, of Guernsey, photo-
graphic artist. An improved process for producing
photographic pictures, which he intends to deno-
minate "Système Garnier de Photocherographie
coloriée."

490. Richard Van Valkenburgh De Guinon, of
Brooklyn, New York, United States of America.
Improvements in anchors.

492. James Wood, of Barbican. Improvements
in ornamenting woven fabrics for bookbinders and
others.

Dated March 6, 1855.

494. William Hyde, of Spring-hill, Ohio, United
States of America. Improved marine life-preserv-
ing apparatus.

498. Joseph Player and Luke Duncan Jackson,
of Winchester-buildings, London. Improvements
in the construction of furnaces for the prevention
of smoke.

500. Thomas Lawson, engineer, and Matthew
Thompson, fire-brick manufacturer, of Gateshead-
on-Tyne. Improvements in the consumption and
prevention of smoke.

Dated March 7, 1855.

502. John Kennedy, of Liverpool, Lancaster,
boot and shoe-maker. Improvements in the ma-
nufacture of boots and shoes.

503. James Higgins, of Salford, Lancaster, ma-
chine-maker, and Thomas Schofield Whitworth,
of the same place, mechanic. Improvements in
the manufacture of small arms, part of which im-
provements is also applicable to hardening other
articles of metal.

504. Joseph Cooper, of Birmingham, Warwick,
brace and bit manufacturer. Certain improve-
ments in joiners' braces, and in the mode of form-
ing or partially forming the various bits to be
used with such, or any other kind of brace.

505. William Weild, of Manchester, Lancaster,
machinist. Improvements in looms or machinery
for weaving pile fabrics.

507. John William Sloughgrove and James
Henry Wheatley, of Windsor-street, Islington, en-
gineers. Improvements in smoke-consuming fur-
naces.

508. James Murdoch Napier, of York-road, Lam-
beth, Surrey. Improvements in machinery for
manufacturing balls or projectiles for small arms.

510. John Wilson, of Hurlet, Renfrew, esquire,
and John Horsley, of Cheltenham, Gloucester,
analytical chemist. Improvements in the manu-
facture of iodine and iodides, and of a pigment or
pigments from certain residual products in such
manufacture.

Dated March 8, 1855.

511. Barthelemy Louis François Xavier Fle-
chelle, gentleman, of Paris, France. Improve-
ments in flat-purses (porte-monnaies.)

512. Louis Emile Bataille, civil engineer, of
Paris, France. Improvements in looms for weav-
ing pile fabrics.

513. Gustav Charles Reitheimer, of Holyhead,
Anglesea, North Wales, civil engineer. Improve-
ments in the means of loading or discharging fire-
arms.

514. Thomas Walker, of Birmingham, Warwick,
engineer. Improvements in rotary engines, to be
worked by steam or other fluid.

515. Antoine François Jean Claudet, of Regent-
street, Middlesex, photographic artist. Improve-
ments in stereoscopes.

516. George Hazeldine, of Lant-street, South-
wark, Surrey, coach-maker. Improvements in
wheel-carriages and in the wheels thereof.

517. Alfred Krupp, of Essen, Prussia, cast steel
manufacturer. Certain improvements in the con-
struction of railway-wheels.

518. James Brooks, of Bury, Lancaster, me-
chanic, and William Stephen Walter, of the same

place, millwright. Improvements in looms for weaving.

519. John Taylor, of Spring-grove, Isleworth, Middlesex, architect. An improvement in packing and preserving eggs and other articles of food.

520. Henry Gilbert, of Kensington, Middlesex. Improvements in hurdles.

521. John Aitken and Servetus Aitken, manufacturers, and John Haslam, manager, all of Bacup, Lancaster. Improvements in machines used for preparing, spinning, and doubling cotton, wool, flax, silk, and other fibrous materials.

522. John Norton, of Dublin, Ireland, esquire. Improvements in fire-arms and ammunition.

523. William Foster, of Black Dike Mills, near Bradford, York, spinner and manufacturer. Improvements in machinery or apparatus for drying wool and other fibrous substances.

524. William Foster, of Black Dike Mills, near Bradford, York, spinner and manufacturer. Improvements in machinery or apparatus for cleansing wool and other fibrous materials.

525. Julian Bernard, of Club-chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture of boots and shoes, or other coverings for the feet, and in the machinery or apparatus to be employed therein.

526. John Gerard, of Guernsey. A portable floating pier or bridge, separating into sections, which are designed and adapted for forming floating vessels, also fixed and movable structures on land, such as sheds and vehicles.

Dated March 9, 1855.

527. George White, of Laurence Pountney-lane, Cannon-street, London, agent. Improvements in the treatment of horn and other substances of a similar nature. A communication.

528. Patrick Dall, of Woolwich, Kent, engineer in the Royal Navy. Improvements in self-acting, indicating, and recording mechanism for steam-engines.

529. James Bullough, of Accrington, Lancaster, manufacturer. Improvements in looms and apparatus for weaving.

530. James Murdoch, of Staple-inn, Middlesex. An improved shade or reflector for lamps. A communication.

531. James Murdoch, of Staple-inn, Middlesex. An improved method of enlarging or reducing designs, maps, and other similar articles, also apparatus or machinery to be employed in the same. A communication.

532. Francis Augustus Barnett, of Nelson-street, Bristol. An improvement in the manufacture of metallic bedsteads and couches for the use of invalids, applicable to bedsteads and couches made from any other material.

533. Thomas Hill, of the Birches, Stanton Lacey, Salop, land agent. Certain machinery or apparatus to be employed in the manufacture of bricks, drain-pipes, tiles, and other like articles from plastic materials.

534. Samuel Cunliffe Lister, of Manningham, near Bradford, York. Improvements in treating and preparing the fibres of flax and hemp, and other fibrous substances for spinning.

535. George Tomlinson Bousfield, of Sussex-place, Loughborough-road, Brixton, Surrey. Improvements in preparing wool and other fibrous substances for spinning. A communication from Jean Joseph Jules Pierrard.

536. Samuel Cunliffe Lister, of Manningham, near Bradford, York. An improvement in combing the noil of silk waste.

538. Samuel Cunliffe Lister, of Manningham, near Bradford, York. Improvements in machinery for combing wool and other fibres.

Dated March 10, 1855.

540. William Mickle, of Willington, Durham, colliery agent. Improvements in the smelting or production of iron from its ore in blast-furnaces.

542. Joseph Sunderland, of Marsden, near Burnley, Lancaster, grocer. Improvements in self-acting apparatus for controlling or regulating the flow of liquids from casks or other vessels.

546. Robert Brisco, of Low Mill House, Saint Bees, Cumberland, esquire, and Peter Swires Horsman, of St. John's Beckermet, in the same county, gentleman. Certain improvements in the preparation of flax.

Dated March 12, 1855.

548. David Hunter Brandon, of Beaufort-buildings, Strand, Middlesex. Certain improvements in machinery or apparatus for cutting fustians and other piled fabrics. A communication from W. R. Harris and W. E. Baker, of the United States of America.

550. James Hulls, of Plaistow, Essex, and John Lowe, of Lambeth-road, Surrey. Improvements in coating iron and other metals with lead.

552. John Gilbert, of the Engine Works, Boston-street, Hackney, Middlesex, engineer. An improved pump or pumping apparatus.

554. William Score, of Bristol. An improvement in bleaching oils, fats, and resin.

Dated March 13, 1855.

556. David Macaire, gentleman, of Paris, France. Improvements in casks and taps.

560. Samuel Swingle, of Aston-juxta-Birmingham, Warwick, manufacturer. An improvement or improvements in the manufacture of certain kinds of metallic spoons, forks, and ladles.

562. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of engine to be actuated by the expansive force of explosive mixtures. A communication.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," March* 27*th*, 1855.)

2412. Samuel Pearson. An improvement in the manufacture of gun-barrels, pipes, and tubes.

2431. John Platt. Improvements in machinery or apparatus for making bricks.

2444. William Coulson. Improvements in machinery for mortising, tenoning, and boring.

2451. Henry Diaper. The application of a new material to the manufacture of paper.

2466. John Henry Johnson. Improvements in the preventing or removal of incrustation in steam boilers. A communication from Nicholas Augustin Baudoux, of Paris, France, merchant.

2472. Edmund Eabors, Matthew Robinson, and John Kendrick. Certain apparatuses or contrivances for holding hats in churches, chapels, and other public assemblies.

2473. Charles Crickmay. Improvements in single and repeating or revolving fire-arms, and in the mode of attaching bayonets to breech-loading fire-arms.

2492. Thomas Greenshields. Improvements in treating cotton waste that has been used by railway companies, and preparing it to be used again.

2571. James Edward McConnell. Improvements in steam engines.

2642. Arthur Lyon. Improvements in machines for reducing or mincing meat and other solid edible substances.

2675. Joseph Gorton Briggs. Improvements in the manufacture of fuel.

2676. James Langridge and Richard Langridge. Improvements in stays or corsets.

77. William Lynall Thomas. Improvements in projectiles and gun-wads.
216. Henri Louis Dormoy. Certain improvements in braiding or plaiting machinery. A communication.
273. Thomas Barnabas Daft. Improvements in the manufacture of beds, or surfaces to recline or lie on.
302. Frederick Ransome. Improvements in drying articles made of plastic materials.
320. Auguste Edouard Loradoux Bellford. Certain materials to be used for cementing and painting, and also applicable to printing and dressing or finishing fabrics. A communication from Professor Frederic Kuhlman, of Lille, France.
328. John Foster. Improvements in machinery for the manufacture of lace.
402. William Henry Zahn. Certain improvements in windmills. A communication.
441. George Mackay Miller and John Wakefield. Improvements in pistons for engines driven by steam or other elastic fluid, which improvements are also applicable to the pistons or plungers of reciprocating pumps.
448. Henry Penney. An improved mode of treating vulcanized or cured India-rubber.
454. George Mackay Miller. Improvements in axles and axle-boxes of engines and carriages in use on railways.
482. William Johnson. Improvements in coating iron and steel wire with other metals or alloys. A communication from Alexandre Désiré Eugene Boucher and Adrien Muller.
486. Andrew Hotchkiss. Improvements in projectiles.
504. Joseph Cooper. Certain improvements in joiners' braces, and in the mode of forming or partially forming the various bits to be used with such, or any other kind of brace.
514. Thomas Walker. Improvements in rotary engines, to be worked by steam or other fluid.
522. John Norton. Improvements in fire-arms and ammunition.
534. Samuel Cunliffe Lister. Improvements in treating and preparing the fibres of flax and hemp, and other fibrous substances for spinning.
550. James Hulls and John Lowe. Improvements in coating iron and other metals with lead.
562. Alfred Vincent Newton. An improved construction of engine to be actuated by the expansive force of explosive mixtures. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed March 23, 1855.

2066. Louis Cornides.
2075. Charles Barraclough.
2085. William Hutchinson and William Barlow.
2087. George Crux.
2115. Christopher Hill.
2133. Aimé Antoine Joseph Legentil.
2155. George Thomas Selby.

1855.

171. Peter Arkell.

Sealed March 27, 1855.

2086. William Beckett Johnson.
2094. Walter Sneath.
2100. Gémis Filhon.
2101. Thomas Collins.
2108. William Woods Cook.
2118. William Tatham.
2120. John Jeyes.
2131. William Peel Gaulton.
2135. Thomas Prosser.
2145. Thomas Bennett.
2148. François Durand.
2154. Robert Way Uren.
2166. Samuel Hancock.
2210. Etienne Bernot.
2239. Thomas Biggart and Allan Loudon.
2315. John Henry Johnson.
2366. Charles William Siemens.
2399. Peter Armand Lecomte de Fontainemoreau.
2759. George Edward Dering.

1855.

11. George Peacock.
66. Henry Bessemer.
73. Edward Hall.
75. Elmer Townsend.
146. John Irwin Clarke.
155. William Douglas and John Carswell.
201. William T. Vose.
202. Isaac Atkin and Marmaduke Miller.
220. Arthur Collinge.
223. John Henry Johnson.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
March 2	3690	J. Rhodes	Nottingham	Radiating Gas-stove.
3	3691	W. P. Helby	Portsea	Stays and Corsets.
7	3692	J. Elce and J. Bond	Manchester	Temple-holder.
"	3693	S. Mordan	City-road	Pencil-leads Protector.
8	3694	J. Brookes	Huddersfield	Silk-preserver.
19	3695	J. Deacon	Clerkenwell	Beer-engine.
20	3696	Harely and Jolly	Westbourne-grove	Letter-damper.
"	3697	W. Standing	Rochdale	Mule-spring.
"	3698	J. B. Harman	Bucklersbury	Oil-burner.
23	3699	Wheatman and Smith	Sheffield	Mill-saw Tiller.
24	3700	Price's Candle Company	Vauxhall	Hospital-stove.

LIST OF PROVISIONAL REGISTRATIONS.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
March 1	642	A. Jones and Co.	Dublin	Folding-top Table.
2	643	R. Prost	Oxford-street	Barrel Tilt.
5	644	Butterworth and Co.	Southwark	Shoe Fastener.
14	645	A. H. Jones	St. Luke's	Pocket Detector.
17	646	W. Bradshaw	Dublin	Camp Bedstead.
22	647	W. P. Astley	Falcon-square	Brace.
24	648	G. W. Willis and W. Gosling	Hampstead-road	Cooking Lamp.

NOTICES TO CORRESPONDENTS.

David Mushet.—Your letter on Renton's malleable iron process shall appear in our next.

T. Livesey.—The method of catching rats on board ship and in other places, by means of a balanced board which trips and descends with them into a vessel containing carbonic acid, is well known.

H. S.—Do you not see that, if the propelling effect were obtained by the direct action of the unbalanced pressure of the steam on the end of the cylinder, the locomotive would oscillate, moving forward with one stroke of the piston, and backward with the other?

Directeur.—We know not how to afford space for an extension of the discussion in which your letter takes part.

J. Whitelaw.—We cannot consent to publish the advertisement you have forwarded to us.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Mason and Co., Dublin; W. C. Campbell and Co., Hamburg.

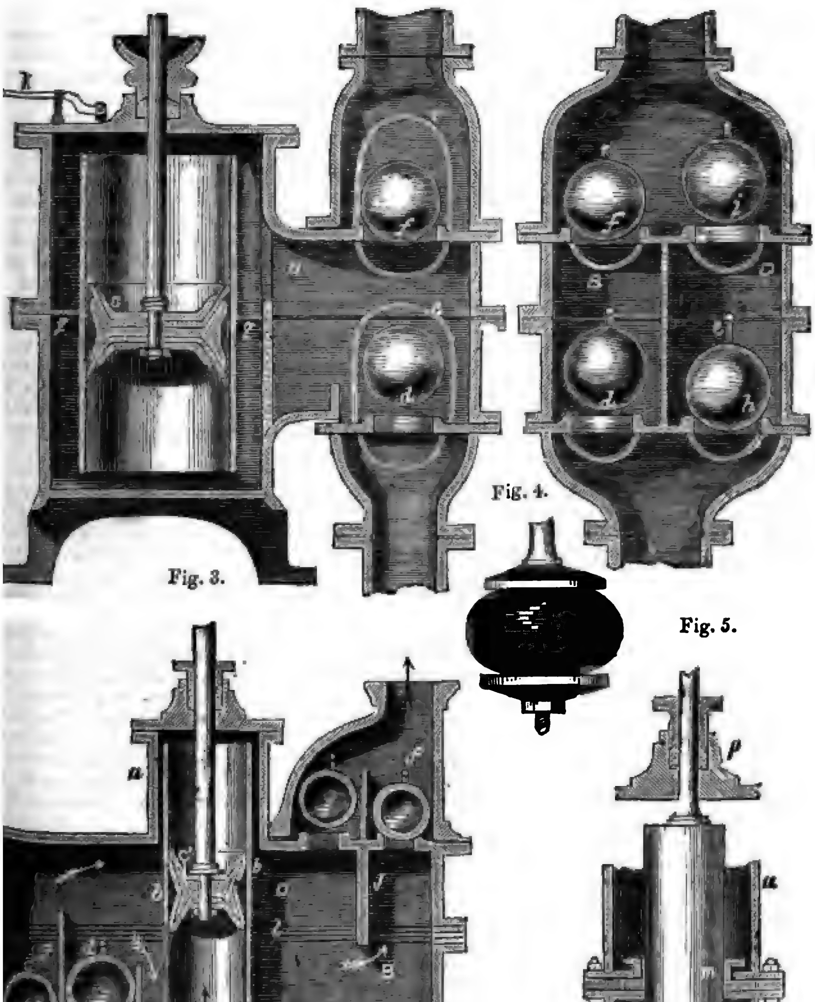
Mechanics' Magazine.

No. 1652.] SATURDAY, APRIL 7, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

DELPECH'S PATENT "CASTRAISE" PUMP.

Fig. 1. Fig. 2.



DELPECH'S PATENT "CASTRAISE" PUMP.

(Patent dated July 4, 1854.)

M. Delpech, of Castres, France, patented in this country, at the above date, a new form of double-acting pump, for which he claims the advantages "of being economical in construction, of occupying but little space, of being easily taken to pieces and put together, and of delivering a larger quantity of liquid than the pumps in common use."

The first arrangement described by the inventor is shown in figs. 1 and 2 of the engravings on the preceding page, of which the former is a longitudinal section, and the latter a transverse section, taken through the valve-box. The pump consists of an outer casing, *a*, of cast iron or other suitable material, made in two parts, and separated by a diaphragm or partition, *q*. The two parts of the casing are bolted together with the diaphragm, *q*, between them. To this diaphragm is firmly fixed the thin brass cylinder or barrel, *b*, in which moves the piston, *c*, which is formed of bands or caps of leather, vulcanised caoutchouc, or other suitable material, the edges of which bands project beyond plates of metal between which they are fastened, so that they are forced into close contact with the cylinder or barrel by the pressure of the liquid. The piston in rising draws up the liquid, which raises the ball-valve, *d*, which is limited in its motion by a stop or cage, *e*. When the piston descends, the water raises the ball-valve, *f*, and closes *d*. These ball-valves are made of caoutchouc. A stop or cage, *g*, is placed under the valve to retain it, if it should accidentally be so much compressed by the pressure of the liquid as to be forced through its seat. The pump is double acting, and while the lower part, A, of the cylinder is producing the effect above mentioned in the compartment, B, of the valve-box, the upper part, C, of the cylinder, which communicates with the compartment, D, of the valve-box, is acting in a similar manner on the suction-valve, *h*, and the force-valve, *i*, which are similar to *d* and *f*. The valves, *i* and *d*, will thus be open when *f* and *h* are closed, and *vice versâ*. The compartments, B and D, are separated by a partition, *j*. *k*, in fig. 1, is a loaded valve, which serves for the escape of the air on starting the pump. A section taken through the compartment, D, of the valve-box, and another through the compartment B, are also shown in the figure. The two parts are similar, except that the compartment, B, communicates with the lower part of the casing, *a*, while the compartment, D, communicates with the upper part of the same.

"When the piston reaches the end of its stroke," says the patentee, "the momentum of the column of water will cause it to continue its motion for a short time. This is owing to there being very little impediment offered to the water on account of the lightness of the valves, and the directness of the passage through the valve-box. The pump is thus capable of delivering a larger quantity of water than is due to the contents of the barrel multiplied by the number of strokes. Solid ball-valves of caoutchouc have great advantages, inasmuch as they are raised by a very slight difference of pressure, and make a perfect joint when closed. In lieu of making them solid, they may be made hollow, and filled with shot or other materials, by which means balls of different weights may be obtained. The valves may also be made of wooden balls, covered with leather or felt, or vulcanized caoutchouc."

Fig. 3 is a section showing the second arrangement of the pump, the details of which are somewhat varied; *a* is the casing, and *b* is the cylinder or barrel, attached to a diaphragm or partition, *l*, which is fixed between the two portions of the casing, as before. The two suction-valves, *h* and *d*, are placed side by side, as are the two force-valves, *e*, *f*. The two compartments, B and D, of the valve-box, are separated by partitions, *j*. The valves here shown are ball-valves filled with shot, as before described. The piston, *c*, consists of a block of metal of the form shown in the figure, and encased in vulcanized caoutchouc. By the ascent of the piston, the water is drawn through the valve, *d*, into the lower part, A, of the barrel, and is driven by the descent of the piston through the compartment, B, and valve, *f*. The piston, in descending, draws the water through the valve, *h*, into the upper part, C, of the barrel, and, on ascending it, forces it through the compartment, D, and valve, *i*.

The patentee also describes a third arrangement of the pump, which is similar to that shown in figs. 1 and 2, except that the passage from the upper part of the pump to the valve-box is so made that the air can escape from the upper part without requiring a valve for the purpose like that shown at *k*, in fig. 1. In this pump a piston, formed of a ball of vulcanized caoutchouc, confined between two plates of metal, shown separately in fig. 4, is employed.

Fig. 5 is a section, showing a plunger, *m*, working through an elastic diaphragm or stuffing-box, *q*, which separates the upper and lower compartments, C and A, of the casing, *a*. *p* is the ordinary stuffing-box, through which the rod works. This plunger may be substituted for the pistons and cylinders before described. Either of the pistons and valves before shown may be employed with either of the varieties of this pump, or with any other descriptions of pumps. Other kinds of valves may also be employed in the different arrangements of the "Castraise" pump.

DU TREMBLEY'S COMBINED VAPOUR ENGINES.

The English proprietors of Du Trembley's patent have received a letter, giving the results of a voyage made by *La France*, a vessel belonging to a French Company. This vessel has been recently chartered by the Government of that country, to carry troops, horses, gunpowder, and other ammunition, from Marseilles to Kamiesch,—a service in which she has been most successful. The writer of this letter, which we have seen, institutes a comparison between the cost of the voyage of *La France* from Marseilles to Kamiesch and back, and that of a similar trip which has just been completed by an English vessel belonging to the General Screw Company, the *Hydaspes*, a vessel which is slightly inferior in speed to *La France*, and which comes near her in point of size;—the *France* having exactly three-fourths of the tonnage of the *Hydaspes*. The consumption of coal, however, in the two vessels has not been in the proportion of three to four, but in that of three to seven; that is to say, while the *Hydaspes* has burnt 700 tons to make the voyage out and home, the *France* has only consumed 300 tons. This striking inferiority of the English vessel, as compared with the French—an inferiority which (even after allowing for the difference of tonnage) has caused her voyage to be so much more costly than that of the French one—is well calculated to excite attention; for, while most of us are prepared to admit our inferiority in works of art, we are apt to believe, that, in all things relating to engineering, and, certainly, to mechanical engineering, there is a marked superiority in our productions.

Although we have before published a description of Du Trembley's engine, a short account, free from all technicalities, of the principle of his invention may be fitly given here, as it is a subject of great importance, especially to holders of shares in a non-dividend-paying steam company, and is also of interest to mere tax-payers, as they are directly concerned in one of the largest and most unprofitable steam jobs ever heard of,—namely, the hire of transports by our Government.

In an ordinary steam engine, the steam which is generated in the boilers passes into the cylinders, where, by a suitable apparatus, it is made to exert its pressure alternately on either side of the piston, thus giving to it, and its rod, the reciprocating motion which is afterwards converted into the rotary action of the paddle or screw, as the case may be. After the steam has done its work in the cylinder it is conducted into a large chamber, called the condenser, where it is mixed with a jet of cold sea-water which takes its heat from it, and condenses it, and thus, by producing a partial vacuum, adds to the power of the engine. The greater part of the mixture of condensed steam, and condensing water, is then pumped out into the sea; and the heat contained in it is of necessity nearly all wasted, only so much water being returned to the boilers as is necessary to produce a fresh volume of steam equal to that condensed. This quantity, compared with the whole amount, is very small, viz., not above one twenty-sixth of the total bulk; so that twenty-five twenty-sixths of all the heat developed by the fuel is wasted, being passed into the sea, after having been made useful but once. In order to have uniformity of action, two engines, the strokes of which are not coincident, are coupled together, and it is this arrangement which gives rise to the well-known phrase, "a pair of engines," in a steam boat.

Du Trembley's invention has for its object the saving a large portion of this so wasted heat. In his e·gines (which are also but a pair), the steam exerts its action in one of the cylinders only, and, after having escaped from it, is condensed, not by mixture with cold sea-water, but by being introduced into a series of pipes similar in principle to the worm of a still, which worm is surrounded by cold ether or some other analogous liquid, boiling at a low temperature. By this arrangement, it will be at once understood, the steam contained within the worm would be condensed, and in the process would give off its heat to the external ether; and as ether boils at less than half the boiling point of water, a copious supply of ether steam would be produced, which could be made available for working the second engine of the pair. This theory Du Trembley really brings into practise. His second engine is exactly like the first—that is to say, it is an ordinary steam engine, but it is impelled by the vapour of the ether, raised, at no cost, by the condensation of steam from the first engine, which is, therefore, the only one of the two which requires the consumption of coal. When the ether vapour has done its work, it passes into another worm, surrounded by cold water, is there condensed again into liquid ether, is passed back into the case surrounding the first worm, there again to condense steam and to be itself converted into a fresh volume of ether vapour.

It will be perceived, from this description, that the force of one of the engines of the pair has been obtained from that which, under the existing system, is mere waste

heat; and that the ether, and also the original bulk of water with which the boilers were filled, works over and over again in a circuit, without loss, without mixing with the salt water of the ocean, and, we need hardly say, without mixing with the water contained in the boilers.

There is another benefit attending the use of this system, and that is, not only is the economy arising from the use of a second cylinder propelled by the waste heat of the first obtained, but there is the great and additional one due to the use of fresh water in the boiler. The advantage of this has been so well appreciated, that many patents have been taken out with the sole object of obtaining this benefit in the common steam engine, whereas in this engine it is, as it were, a mere inevitable consequence of the system, and is, so to speak, thrown into the bargain,—although it is, as our readers are well aware, far from being of inconsiderable value. Of course, any scientific man, judging from these data, would have predicted those great results which have been verified by the performance of *La France*, and for the particulars of which we waited.

The engineers to whom this project was first submitted, started the palpable objection that ether was a costly, and also an inflammable liquid. Ether, when bought wholesale, is by no means so overwhelmingly expensive as is generally supposed; and even if it were, so perfectly is machinery jointed in the present day, that the expense is only to be seriously considered at the first charging of the vessels, as the daily waste, even in a large vessel like *La France*, amounts but to 21½ francs, equivalent to about one-sixth of a ton of coal at Kamiesch, where coals are allowed for by the French Government at the rate of 4*l.* 16*s.* 8*d.* per ton. As regards inflammability, we need only say, that the French Government, who certainly cannot be accused of want of system or of care, selected *La France* as a fit vessel to carry not only troops, eighty horses, and cannon balls, but also sixty tons of gunpowder and shells; not very likely things to have been sent, by persons of even ordinary prudence, in vessels which were supposed to be less safe than any of the fleet of steamers with which the port of Marseilles was crowded at the time *La France* was taking in her cargo. We may also add, that the first vessel fitted on this system, named after the inventor, the *Du Trembley*, which has been plying between Marseilles and Algiers since June, 1853, with unvarying success, at lower fares than ordinary steam vessels, and which belongs to the eminent firm of Arnaud Touache, Brothers, of that city, has been insured *at the ordinary rate* of other steam boats, after a due inspection by the surveyors of the Insurance Office.

Hitherto we have spoken of ether as though that were the only liquid that had been thought of for these novel engines; but there are, as is well-known, many others which boil at equally low temperatures, some of which are obtained from the refuse of gas works, and cost little more than the expense of distillation, which is trifling.

Had the *Hydaspes* been fitted on the *Du Trembley* system, and had she thus been enabled to make her voyage for 400 tons of coal, in lieu of 700, the thus diminished cost of coals, great as it would have been, would not have formed, by any means, the sole, or even the greatest advantage that would have arisen from the use of the ether engine; as to save coal is *to gain space*, and thus not only is the actual decrease in coal to be taken into account, but also (and more especially in long voyages) the value of the freight of the extra cargo that can be carried in the space thus set free. For example —the large vessels, such as the Cunard line of steamers running between Liverpool and America, consume from 2,000 to 2,400 tons per voyage out and home, while the space left in them available for cargo is not above 400 tons. Had these vessels been fitted with Du Trembley's engines, not only would they save, say 600 tons of coal, worth perhaps £750 per trip, but they would take 300 tons more cargo each way, at a freight of between £5 and £6 per ton—thus earning an extra £3,000 to £3,600 per double voyage, besides saving £750 in actual cost of coals. In fact, it has been calculated by an eminent English engineer (a maker of marine engines), that were the Peninsular and Oriental Company to adopt this plan for the whole of their large fleet, from the increased earnings arising from the additional freight they could carry, they would thus be able to pay for three-fourths, if not the whole of the coal they consume, which, in 1853, came to £240,000, or nearly a quarter of a million sterling.

It may be interesting to give some slight sketch of the progress of this invention. Owing to the unsettled state of France, from 1848 to the ascent of the Emperor Napoleon, it was, during that period, comparatively in abeyance; although, by the advice of Arago, when Minister of Marine, Admiral Des Fossés' attention was directed to it, and he caused experiments to be tried by a commission of engineers, chemists, and naval officers, on a stationary engine, which had been constructed at Paris and sent by the government to the arsenal at L'Orient. This commission continued their investigation for fifteen months,

and ended by giving so favourable a report on the system, that a corvette of war, called the *Galilée*, was ordered to be laid down, and to be fitted with the combined vapour engines. From political causes this vessel has been much delayed, but she is now near completion, and her progress is stimulated by the great interest which the Emperor takes in her.

The first really practical application of this patent to steam navigation took place about two years since, when, in June, 1853, the auxiliary screw-steamer *Du Trembley*, of 60-horse power, made her first voyage from Marseilles to Algiers. She had on board a scientific commission, appointed by the French Government, who were thoroughly satisfied with her performance. Since then she has continued to ply as a regular trader; and some few months after she commenced running, was visited by Mr. George Rennie, the eminent English engineer, who made the voyage from Marseilles to Algiers and back in her, in most tempestuous weather, and thus had an opportunity of seeing her thoroughly tested. His report, which we have now before us, speaks in most favourable terms of her performance. A few weeks since, she also was chartered by the French Government for Constantinople, where she now is. As we have before mentioned, this vessel is the property of Messrs. Arnaud Touache, Brothers, who manage a Steamboat Company trading between France and Brazil; and so satisfied were they with the performance of the *Du Trembley*, after many months' experience, that they decided on altering the engines of two new vessels for this Company from the ordinary construction, on which they had been commenced, to the combined vapour system. These vessels are, *La France*, the ship whose performance has called forth this paper, and *Le Bresil*, a sister-ship in every respect. They are of a size which takes them entirely out of the class of experimental vessels; that is to say, they are 224 feet in length, and 36 feet beam, and are fitted with engines on Du Trembley's plan, made by the English house of Taylor and Co., of Marseilles, and of the nominal power of 300 horses. *La France* left Marseilles for Kamiesch on the 13th January in this year. *Le Bresil* is now finished, has been tried and approved by the French Government, and is now loading for them at Marseilles. Since the return of *La France*, Messrs. Arnaud Touache, Brothers, have ordered the construction of three larger vessels, and have entered into a contract with the proprietors of the patent for the exclusive privilege of the French Mediterranean trade, for which they have considered it worth while to pay a heavy sum. Another Company, established under the title of the French American Company, for the direct navigation from France to the United States, have had constructed, at Nantes, the first two vessels for their line, one of which, *Le Jacquart*, was launched on the 18th November last. She is of iron, and 242 feet in length. The combined vapour engines for these vessels are in a very forward state, at the manufactory of M. Cavé, at Paris, and are 500-horse power each. In addition to this, M. Givord has sold licences, which are now eagerly sought for, to several River Companies, and to numerous persons in different parts of France, for stationary engines.

This concludes the history of the patent in France up to the present time. The invention has been secured in England, and has been examined and favourably reported on by several eminent engineers, among whom we may mention Mr. Rennie, Mr. Seaward, and Mr. Hensman, of the Bank of England (to whom the machinery at the Great Exhibition was confided). We are much pleased to find that the English Combined Vapour Engine Company have appointed Mr. Bramwell, who was present at the trial of *La France*, at Marseilles, previous to her departure for Kamiesch, and whose opinion agrees with the favourable one pronounced by the gentlemen previously named, as their engineer, and we have but little doubt that the use of Du Trembley's invention will now become general in this country.

ON SIEGE OPERATIONS.*

BY EDWARD JEKYLL, ESQ., M.R.I.

The lecturer, after a few preliminary observations, commenced by stating, that it is absolutely necessary for a besieging army thoroughly to invest the place about to be attacked; that is, simultaneously to occupy positions so as to cut off all communication with the threatened fortress, and to have a numerical force seven or eight times the number of the pent-up garrison. A reconnoissance is then made by the engineers, who, during the first part of the investment, are employed in taking notes of the description of the different fronts of the fortification, in making a correct plan of the work, and the ground in its vicinity; in which the course of rivers, streams, ravines, and roads, the extent of possible inundations, woods, marshes, or eminences, are accurately laid down. They mark out, with great precision, by means of pickets, placed in the ground, the prolongation of all the faces of the most prominent works, and the salient

* The substance of a paper recently read at the Royal Institution.

angles as well: not only because the latter are the shortest road to the fortress, but because they are also the paths the least exposed to the enemy's fire.

During this reconnoissance, the besieging army, having encamped out of range of the guns of the place, send forth large working parties to cut down all the timber and brushwood in the neighbourhood, wherewith to construct the necessary materials for the siege. These consist of gun platforms, timber for the lining and support of mine shafts, galleries, and magazines; but more particularly for the making of gabions, sap rollers, and fascines.

The *gabion* is a cylindrical basket of wicker work, open at both ends, and of various dimensions, but usually from three to four feet in height, and three feet in diameter. Its use and object being to construct hastily a shot-proof breastwork or parapet, when filled with earth, or to line the approaches and batteries when the soil is of a loose and crumbling nature.

The *sap-roller* consists of two concentric gabions, placed one within the other, each six feet long, the interval between them being stuffed with logs of hard wood; the whole mass far exceeding the dimensions of the ordinary gabion. It is employed to protect the sapper engaged at the head of an approach or trench, when advancing such work towards the enemy.

The *fascine* is a faggot of brushwood, 18 feet in length, and nine inches in diameter; its use being to line the parapets, and various earthworks constructed during the progress of the siege.

Bags filled with earth are also prepared, and largely employed during the operations; the whole are then stored in that part of the camp called the Engineers' Park. The number of these materials is enormous, and the following estimate often has to be exceeded, or even doubled, namely, 80,000 gabions, 100,000 fascines, 120,000 sand bags, together with 4,000 spades and shovels, and 3,000 pickaxes, with other tools in like proportion.

The enemy having been kept in ignorance of the front of the fortress about to be attacked, and all the necessary arrangements having been made, let us examine the object of the assailant, and the manner in which he may best proceed to effect it. His endeavour is to possess himself of a fortress, and having seven or eight times as many troops as are shut up in the work, it follows that the larger number will overpower the weaker, if brought to a close combat; but the battle-field of the foe is so organized as to prevent such collision, surrounded as it is by obstructions which the assailants must overcome: the besieger is, therefore, compelled to use both industrious and scientific means, in making his attack, requiring more or less time in their completion, in proportion to the defences of the place, its strength, and the courage of its protectors.

The means employed since the invention of artillery, consist in choosing the front to be attacked, checking its fire, and in making a safe road by which the besieger can advance unseen to the foot of the ramparts; and lastly, in placing in well protected batteries his artillery to subdue the place and effect a breach in the walls of the fortress.

The first operation of the besieger is, to approach secretly by night with a working party of 1,800 men, each carrying a fascine, pick-axe, and shovel, accompanied by an armed and protecting force equal to cope with the garrison; the former dig a trench 2,000 yards in length, parallel to the fortifications attacked, (the direction having been previously marked out by the engineers,) and with the earth excavated from such trench, raise a bank or breastwork on the side nearest to the enemy; while the armed party, formed in a recumbent posture, remain in readiness to protect the workmen, should the garrison sally forth to attack them. During the night and following day the besiegers remain in the trench, till sufficient cover is gained to protect from the fire of the fortress all engaged, whether workmen or their appointed guard; but as each fifty men have a certain task allotted to them, they are relieved by a like number at the expiration of their labour.

This work, called the *first parallel*, is an envelope equi-distant from all the salient angles of the fortress, and it is along this road that all guns, men, and munitions can securely move, sheltered from the view and projectiles of the enemy. Batteries are then formed on the side next the place attacked, and a secure communication, made in like manner, is constructed towards the camp and entrepot of the besiegers.

The garrison having now discovered the front of their work about to be attacked, do all in their power to add to their defences; a double line of palisades is placed in the covered way; traverses are erected to lessen the effect of the enfilade and ricochet fire of the besiegers; the country on the side attacked is inundated, if such means exist; fresh embrasures are opened on the ramparts, and splinter proofs, to prevent the ravages of shells, are placed over the guns; safe communications are formed, leading to the outworks; mine galleries driven under the glacis (if none had been previously prepared), and every means taken for repelling the advances of the besiegers. The fire from the guns, howitzers, and mortars of

the assailants, is of a four-fold character: direct, to batter down such parts of the fortress as are not covered by the outworks; enfilade, to rake; ricochet, to bound down the faces of the ramparts, and dismount or otherwise injure the artillery; and vertical, or that from mortars, to destroy the storehouses, magazines, barracks, or depôts, within the walls of the place.

After some days' fire, the same species of covered road is carried forward from the first parallel, by certain rules of art, to approach the fortress; this trench proceeds in a zigzag direction, crossing and re-crossing the direct line leading to the salient angle of the fortress, care being taken that its direction is such that no fire from the enemy can rake or enfilade it. And at a distance of 300 yards from the works of the besieged, a new place of arms, or second parallel, is constructed, similar to the first, wherefrom the assailants can support the head of their attack. New batteries are here formed, to further enfilade the threatened works, and also to counter-batter such collateral works of the defenders as contribute to the defence of the place, and the fire of which it is necessary to subdue. The assailant again advances by similar zigzags, till within 150 yards of the covered way of the enemy, where fresh lodgments, called the *demi-parallels*, are effected.

And here an entirely new feature in the attack presents itself: it being needful to keep down the heavy fire of riflemen, and wall pieces (heavy muskets fired from rests upon the parapets), and also to prevent workmen from repairing the injured defences, pierriers, or stone mortars, are placed in the wings of the aforesaid demi-parallels, which keep up an incessant discharge of large stones, 4-pound iron balls, and grenades, upon the front attacked. Volleys of such missiles are directed upon the shattered parapets, driving the defenders from the walls, and forcing them to fly to places of cover and security, protecting themselves from these projectiles by such temporary buildings as they can erect. The enemy in reply keep up a continuous fire from small mortars, called royals and coehorns, upon the head of the advancing trench; light balls (a brilliantly burning firework), thrown by the garrison, disclose the operations of the enemy, who try to extinguish them with sand or wetted hides, and if such means fail, place smoke balls to obscure the light.

The approaches are now carried forward by sapping—a most hazardous duty. The foremost workman, protected by the sap-roller, pushed in front by a long fork, places a gabion on the side nearest the fortress; he rapidly fills it with earth from the trench he is excavating (a labour he performs on his knees), digging the earth eighteen inches deep, and a like width, but never exposing himself beyond the first placed gabion. He is followed by three comrades, who increase the dimensions of the trench, and frequently relieve him in his perilous undertaking; sand-bags are placed in the hollows between each gabion, and thus safe cover is effected; ten feet of sap may be made in one hour. At the late siege of Antwerp, the French sappers were protected by helmets and cuirasses; their weight however, impeded the movements of the men and the celerity of the operation.

At this period of the siege, the fire from the place being much weakened, many guns dismounted, and the ramparts ploughed up by the severity of the besiegers' fire, a third parallel is at length formed at the foot of the glacis, and an attempt made to gain the covered way, the palisades in which have been broken and destroyed by the ricochet batteries. If this is to be effected by assault, the interior of the breastwork of the third parallel is made in steps, so that the assailants may simultaneously sally forth to attain their object; but the slower and more certain method is by the sap and mine. At the siege of Cambray, Dumetz stormed a work during the attack contrary to the advice of Vauban, and sustained a defeat, together with a loss of 40 officers and 400 men; Vauban gained the same object two days later by sap, and lost but three lives.

The covered way being now in possession of the besiegers, breaching batteries to destroy the revetments of the fortress are constructed. The fire of six 24-pounders, so directed as to make perpendicular cuts in the masonry, play upon the wall: one long horizontal fissure, three feet in depth, is also effected, and by the firing in salvos or volleys, the loosened mass and superincumbent parapet falls bodily into the ditch, presenting a slope or means of ascent more or less practicable. The troops are led to the assault by means of a subterraneous gallery leading from the trenches to the ditch.

The garrison now usually capitulates. But if the latter part of the operations are carried on by the system of mining, the entire character of the attack is changed; and as the besieger proceeds with the trenches on the surface of the ground he has to secure himself from below. Twelve days are added to the duration of the siege, if the fortress is ably protected by a well-arranged plan of defensive mines, in the more advanced galleries of which he can listen for the stroke of the miner's pick, and by means of a pea, placed upon a tightly-braced drum, subterraneous workmen can be discovered at the distance of from 60 to 90 feet in ordinary soil; hence such listen-

ing galleries, as they are termed, are built distant from each other 120 feet. When the advancing miner is discovered by the defenders of the fortress, a mine is hastily prepared, and the assailant blown to destruction. Occasionally a long iron probe is used, to ascertain the nature of the ground in front, or the position of the works of the besieged; and if such instrument reaches into the defensive excavations it is followed on withdrawal by a charged rifle or musquetoon, and a shot is fired upon the assailant, or combustibles generating noxious gases are thrust into the aperture.

The subject of mining is far to extensive a one to be embraced in so limited a description, but the globes of compression of the besiegers, or surcharged mines, finally overthrow the network of galleries with which the fortress is surrounded; and the craters or hollows formed by their explosion, afford cover and the more ready means of pushing forward the saps and trenches, and the fortress is compelled to surrender. In describing the various engines of war, and the recent improvements made in them, the lecturer alluded to the making of cannon shot of a conoidal form, and the recently discovered danger of exposing live shells to the enemy's fire, both in batteries and on ship-board; shells struck by shot instantly explode, the blow raising the temperature of the stricken part far beyond the heat at which gunpowder inflames. Some of our first-rate men of war have their lower batteries of shell guns only, and as each gun has two shells in boxes placed over each piece of ordnance, 64 mines are thus prepared for the destruction of the vessel, liable, during action, to add their ravages to those occasioned by the fire of the foe.

In conclusion, comparison was drawn between the attack upon an ordinary pentagon, and the siege now in progress in the Crimea. In the former the prize was sure of being gained, inasmuch as the place was always previously invested; containing a garrison of but 5,000 men, and was defended by 150 pieces of artillery, a portion only of which could be used in the defence of the single side attacked, a length seldom exceeding 320 yards; the besiegers, with an overwhelming force of men and ordnance, having established themselves behind safe approaches, batteries, and a parallel or envelope embracing the fortress of a length of 2,000 yards, finally ruined the defences of the fortress. At Sevastopol investment had been impracticable; the parallel of the allies, broken by the nature of the ground, was of no greater extent than *2,300 yards*, and the Russian defences opposed a length little short of four miles, mounting 800 guns to the 500 of the combined armies, and aided by a garrison whose numbers were unknown and capable of continual augmentation. Screened from enfilade and ricochet fire by the nature and length of their works, and by the difficulty of placing the guns of the allies in favourable positions, the enemy could only be assailed by direct or vertical fire, and the troops rushing to the assault would have to advance to the attack over ground, more or less open and unprotected after leaving the shelter of their trenches.

ON THE APPLICATION OF SCREW PROPELLERS TO LARGE SAILING SHIPS.

A paper on the above subject was read on the evening of Tuesday, March 20, at the Institution of Civil Engineers, by Mr. R. A. Robinson, Assoc. Inst. C.E.

The introduction of screw propulsion in 1839, by Mr. F. P. Smith, and the success he attained with the *Archimedes*, directed attention, said the author, to that system for commercial vessels; the *Great Britain* was an early instance of the application, and then followed the fleet of screw steamers established by Mr. Laming, for the trade between London and the ports of Holland. Thence the progress was so rapid, that at the beginning of 1854, above two hundred commercial screw ships were registered in the United Kingdom. Meanwhile many attempts had been made, for using large powerful screw ships, on the long sea routes to India and Australia, but uniformly without success. The author's object was to investigate the causes of this failure, and to suggest the means of attaining success.

It was observed, that hitherto the screw steamers attempting these long voyages, had been large vessels, with powerful engines, and depending chiefly upon their steam power, had taken more direct routes, independent of wind; and thus, although fully rigged, they had not been able to take full advantage of their sails, but had only used them in favourable winds, or in cases of casualty, or shortness of fuel; and when they had been so tried, their sailing powers were not found to be so good as they might have been. Some of these ships had been obliged, by want of fuel, to run back for very considerable distances, because they were out of the usual track; for instance, the *Great Britain* ran 1,300 miles back, to replenish her stock, and thus materially extended a voyage, which, at its outset, promised to be one of the fastest on record.

Casualties had so frequently occurred, that an impression was given of their being inseparable from the system; this, however, it was contended, was not the case if the machinery was properly constructed and able to work for long periods consecutively. The *Great Britain* was an example of what might be accomplished, by due attention to originally good engines and machinery, such as those adapted to this vessel, by Messrs. Penn and Son. Out of three voyages to Australia and one to New York, she had never been detained an hour by any derangement of her machinery, which had worked consecutively, on one occasion, for as long as forty-two days, without stopping. In the account of her voyages to and from New York in 1852, Mr. F. P. Smith recorded, that under ordinary favourable circumstances, the ship advanced 5·16 miles, per ton of coals, with the slight negative slip of screw = 0·69, and that during three days of strong contrary winds, the ship only ran 2·92 miles per ton of coals, and the slip of the screw was as much as 30 per cent.

The distance from Southampton to Port Philip, viâ the Cape, steaming everything, as a paddle-wheel steamer would do, being 12,030 miles, and the routes of the sailing clipper ships in the favourable wind track, being upwards of 13,800 miles, their relative lengths of voyages were from 60 to 100 days for the former, and 70 to 120 days for the latter.

The quickest recorded runs of screw ships, were those of the *Argo*, of 1,800 tons, and 300 horse power, between Southampton and Port Philip, in 64 days; and the *Victoria*, of 1,853 tons, and 450 horse power between Gravesend and Adelaide, in 59 days 22½ hours, including detentions for coaling.

After examining the records of numerous experiments on screw vessels, under steam and canvas, steam alone, and canvas alone, the author argued that one of the principal obstructions to enabling a "minimum-powered" screw ship, under canvas alone, to compete at all points, with a sailing clipper, was the want of a simple and more efficient mode of lifting the screw propeller out of the water, and stowing it away at the stern, in such a manner as to offer no obstruction to sailing, and yet to enable it to be raised, or lowered in any weather, without difficulty or delay.

The method of disconnecting the screw and allowing it to revolve freely did not meet the objection. Messrs. Maudslay's feathering screw, the blades of which were made to turn, so as to bring them nearly in a line with the stern post, had been applied to several ships, with considerable success. The system of lifting the screw vertically out of the water, although effectual, was troublesome, and in a heavy sea-way could scarcely be accomplished. Mr. Scott Russell had introduced a system of raising the screw out of the water, and stowing it away under the counter, with the blades in a horizontal position. The propeller worked outside the rudder; and the afterpart of the shaft was enabled, by means of a folding joint in the dead-wood, to assume an angular position with respect to the main portion of the shaft, so that it was not necessary for any part to be really unshipped, or disconnected, and the propeller could be raised completely out of the water, and be again lowered into its working position, without any difficulty, in the worst weather. It occupied two men about ten minutes to raise it and about three minutes to lower it, the necessary tackle being always attached. It possessed, moreover, the great merit of not imparting that unpleasant tremulous and lifting motion to the vessel, so much complained of with the ordinary screws. Comparative trials of vessels of similar build, tonnage, and power, demonstrated a decided gain of speed with the outside propeller.

The author then examined the voyages of the *Red Jacket*, the *Sovereign of the Seas*, and other celebrated sailing clipper ships, giving their logs, and showing their speed, on long runs, to be from 8½ to nearly 13 miles per hour. One of this class of ships, of 2,525 tons burthen, was stated to spread about 13,000 yards of canvas, in a single suit of sails.

The early attempts to introduce auxiliary power on board East India traders, especially alluding to those by Messrs. Seawards, were mentioned, and the reasons given for their want of success.

Arguing from the speed now attained by sailing clipper ships, and the successful application of screw propulsion, the author proposed the employment of iron sailing clipper ships, of about 3,000 tons, builder's measurement, with large sail power, and so constructed as to attain the highest possible speed, under canvas alone, and by the aid of screw propellers and auxiliary engines of 200 horse power, to give them a speed of eight to nine knots, under steam alone, in calm weather; the supply of coals to be for not less than fifteen days' full steaming, so that a saving of ten to fifteen days might be anticipated in the voyage each way; the sailing power to be always used to the utmost extent, and the ship to be navigated entirely as a sailing clipper, the steam power being used only in exceptional situations. By this plan, all the good qualities of the fast-sailing clipper could be secured and combined with the power of steaming at a fair speed, during calms, or light winds, and in general this class of ship would attain, at

a minimum cost, the best and most uniform rate of speed for long voyages.

The relative expenses of the simple sailing clipper ship, and of the sailing clipper with auxiliary engine power and screw, were examined in detail, and a difference of 1,675*l.* in favour of the latter, was shown as the result of one voyage to Australia or India. The logs of several vessels were shown, and in a tabular form there were given the speeds attained by all the principal auxiliary screw ships in use, up to the present time.

The discussion on the above paper was proceeded with at the Institution on the evening of the 27th; and it was observed that a fully rigged ship, with square sails set, whilst on a wind, could rarely lay up nearer than six points from the wind, but with fore and aft sails she came up to within four points. If any auxiliary power was used, whereby the speed of such a vessel would be augmented, beyond that due to the sails, she would fall away from her course, just in proportion to the extra propelling power applied. This had been observed in H. M. steamer *Inflexible*, when using part of her steam power to aid the sails, and making about eight knots per hour; she passed many vessels, all standing up full two points nearer the wind than she could do; but on ceasing to use steam, she came up even higher in her course, under canvas alone, than the other vessels, and directly the steam was used, she fell off again.

It was suggested, that the displacement of the vessels should have been given in the tables; as without that information it was difficult to compare the results. Shipbuilders ought to give a scale of displacement, for the guidance of merchants in ascertaining the work done by their ships.

A suggestion was offered, as to the advantage that would result from the accurate statement of the area of the midship section of the ship, and of the indicated horse-power of the engines, when describing any vessel; this would avoid much of the ambiguity of the statements frequently put forward. It was notorious that the actual power was from 1½, to 6 times that of the nominal power of marine engines.

It was contended, that the system of full-rigged clipper ships, with auxiliary power and screw propellers, keeping habitually in the ordinary sailing track, and taking full advantage of wind power, had already been acted upon, as far as was possible, with the *Great Britain*, a ship not originally constructed for the purpose, and that in a few weeks the *Royal Charter*, an iron clipper sailing ship, built expressly with these views, would be launched for Messrs. Gibbs, Bright, & Co., Liverpool. This ship, intended to trade with Australia, would be, 2760 tons burden, 336 feet long, 26 feet deep, 41 feet 6 inches beam, and 200 horse power, with three masts, square rigged.

The first voyage of the *Great Britain*, having shown the advantage that might be derived from giving her more canvas and working the steam power less, on the Australian voyage, her lower yards were made 100 feet long, her top-sail yards were increased to 80 feet in length, and her suit of sails was made to contain 14,000 yards of canvas, which was quite as much as was displayed by any clipper ship. Such were the general qualities of the *Great Britain*, that if the position of her masts could be altered, it was contended she would, under canvas alone, be probably the fastest ship afloat. She had really run 17 knots per hour, when dragging her screw through the water.

The system of lifting the screw bodily out of the water, was objected to, on the score of liability to accident, although on board some of the ships of war it was a common occurrence to lift the screw in about nine or ten minutes, with the power of thirty men at the windlass. It had now been determined to try the system of having a small engine, merely to turn round the propeller at a speed corresponding with that of the vessel whilst under sail, and this, it was anticipated, would be a great advantage commercially.

It was urged, that the nominal tonnage of vessels and the nominal horse power of engines were such indefinite terms, as to be utterly inapplicable data for comparing the merits of the performance of steam ships. In order to illustrate the extent of fluctuation of tonnage, with reference to displacement, and of nominal horse power to the effective working power of engines, an examination had been made of the constructive elements of ten ships, all having power in the proportion of 100 tons of displacement to 40 nominal horse power;—when the results appeared to be:—that as respected the ratio of tonnage to displacement, 100 tons builders' tonnage, gave different amounts of displacement, varying between 57 tons and 157 tons. That as regarded the ratio of nominal horse power, as contracted for, to working horse power, of the unit 66,000 lbs. raised one foot high in one minute, (or 2 horse power indicated) 100 nominal horse power, gave different amounts of working horse power of the unit (66,000 lbs.) varying from 93 horse power to 300 horse power; and, that as respected the ratio of displacement to working horse power, (of the unit 66,000 lbs.) the different amounts

of working power, to 100 tons of displacement, varied from 22 horse power to 185 horse power.

Hence it was argued, that the ratio of tonnage to nominal horse power did not afford any indication of the ratio of displacement to working horse power, of any definite unit.

The valuable assistance of Lieutenant Maury's charts was forcibly alluded to. The difficulty in obtaining details of construction of machinery, of the midship section, and of the displacement, &c., of vessels, was pointed out, to relieve the author of the paper from the allegation, that he had not fully supplied all the particulars demanded for the discussion of the question.

It was suggested, that at the next meeting, members should come prepared to discuss the best proportions of steam power to tonnage,—the best commercial speed,—the means of disposing of the screw, when the vessel was under sail,—the best form of recording observations,—and the general commercial question.

Models were exhibited of Mr. de Bergue's propelling apparatus.* It was stated to possess several advantages over both paddle-wheels and screw propellers:—in cheapness of construction, simplicity, constant effect, from being entirely submerged, saving in weight, expending usefully the entire engine power exerted, absence of vibration in the vessel, capability of working in shallow water, freedom from risk of heated journals, and as being peculiarly adapted for tug boats; in which latter case the propeller would be placed quite beneath the centre of the vessel, in which position it would also be advantageous for floating batteries and gun-boats.

Models were also exhibited of Griffiths' screw propeller, which had been used on board the *Great Britain*, and was stated by the late commander of that ship to have been very successful.

Some propellers, with curved steps on the blades, were introduced by Mr. Walduck, who described the principal advantage to consist in thus obtaining a firm hold upon the water and retaining it, until it passed off at the edges of the blades.† Greater speed was said to have been attained, with an almost entire absence of tremulous motion.

* For a full description of this apparatus see *Mech. Mag.* for January 20, 1855.—ED.

† On page 95, vol. 59, of *Mech. Mag.*, we gave an abstract of the specification of Mr. Donald Beatson's patent for a screw-propeller in the following words:—"This invention relates to screw-propellers, and consists in forming their blades with corrugated surfaces. The directions of the corrugations are in circles about the centre of the screw, extending across the blades," &c.—ED.

ON THE SLAGS OF SMELTING FURNACES.

A very interesting paper, on the above subject, was read on the 29th of March, at the Society of Arts, by Dr. W. H. Smith, of Philadelphia, who is the patentee of certain processes for converting slags into valuable commercial products. After remarking upon the scientific interest which invests the mineral changes and formations of the smelting furnace, and the commercial value of the slag or the mineral products of the smelting furnace, as demonstrated from the importance of the rocks of igneous origin, to which they are analogous—the regularity and uniformity of the chemical laws involved in their formation—the superior properties they possess as an industrial product, especially in their adaptation to architectural uses—the economy of their production—and the abundance of their supply, he proceeded to notice the most important desiderata towards the successful treatment of these products.

"The quality of the slag," said he, "as with the quality of iron or other reduced metal, essentially depends upon the proper management of the smelting furnace. The suitable admixture of fluxes, the prope re-gulation of the heat, &c., being, however, of primary importance in making good metal, generally receive adequate atte tion; and I believe the best managed furnaces of the world are those which I have m t with in Great Britain.

"Great care is required in the withdrawal of the slag from the furnace, to prevent the incorporation or mechanical admixture therewith of miscellaneous *débris*, loose cinder, or other foreign ingredient. Such an admixture produces a heterogeneous material which (as may be seen in the rough blocks cast directly from the furnace mouth, for many years past, at copper and at some iron works) is not susceptible of polish, and soon changes its appearance on exposure to the air. By withdrawing the slag at stated intervals, say once every hour, it can be obtained in better condition than if allowed to run out of the furnace in a continuous stream.

"After its removal from the furnace, the liquid slag should be carefully refined, either by mechanical subsidization or chemical treatment, in order to regulate its specific gravity, and thus insure a homogeneous product.

"Other essential elements of success consist in the protection of the molten and hot material from the sectional polarization of its heat, or thermal-electricity; the employment of suitably-constructed moulds, made of the best non-conducting materials; the proper construction of the ovens for

annealing; the regulation of the temperature of the ovens, so as to insure a vitreous or devitrified product, as may be desired; the employment of the proper alkalis and acids for varying, when requisite, the colour, texture, and other properties of the slag; and suitable appliances for rolling, pressing, stamping, grinding, polishing, &c."

In another part of the paper it was stated, that "according to the treatment it receives, slag can be rendered brittle or tough, hard or soft, compact or porous, rough or smooth. It can be cast into as great a variety of forms, solid and hollow, as iron itself, with the superior advantage of being susceptible of the admixture and blendings of colour, so as to render it equal in brilliancy to agate, jasper, malachite, the variegated marbles, and other more valuable varieties of the mineral kingdom. When properly annealed, it can be made to acquire a surface, or texture, at least ten times as durable as that of marble, and is susceptible of a polish equal to agate or cornelian. As a building material, it can be readily adapted to any variety of architectural design, from the simple slab to the most ornate and complex decoration; whilst its beauty and durability chiefly recommend it as an article of luxury."

In the discussion which followed the reading of the paper, Professor Wilson remarked that "there were some questions which it was necessary to consider with regard to the application of these slags. He could hardly go the full length with Dr. Smith on some points. He (Professor Wilson) thought the constitution of slag was scarcely so definite as that gentleman seemed to think—that unless the several ingredients were chemically combined, and the mass was perfectly homogeneous, the material was liable to be decomposed, especially by the action of the atmosphere. He thought there was also another point which required further proof, and that was one which time only could determine. He would like to see the effect which the action of continual exposure would have upon this material, after it was furnished either in the rough or in the refined and polished form."

DR. GRAY'S SEWER-FLUSHER AND VENTILATOR.

To the Editor of the Mechanics' Magazine.

SIR,—I beg leave to call the attention of your numerous readers to a machine lately invented and patented by a most estimable citizen of Dublin, John Gray, Esq., M.D., proprietor of the *Freeman's Journal.*

That the flow of a slender stream of water through a sewer or house-drain pipe is not sufficient to remove obstructions, nor prevent in them the accumulation of sulphuretted hydrogen, and azotic and other deleterious gases, is a fact sufficiently established by the frequent loss of human life, of which we had recently an instance in the suffocation of a man employed to cleanse the sewer of the North Dublin Workhouse. Dr. Gray proposes, that instead of allowing water to dribble uselessly, *as long as it can*, through a sewer, to collect it rather in a tank or suitable reservoir, and as soon as the water rises to a certain and regulated level therein, a large discharge valve in the bottom of the tank is suddenly lifted from its seat to such a height as not to interfere with the rush of water through the discharge pipe, while simultaneously the influx of water through the supply-pipe is stopped; and when the tank is discharged, the valve slowly and noiselessly descends to its seat, the discharge is registered, the supply-pipe is liberated, and the water commences filling the tank anew.

Dr. Gray's machine is simple in its construction, and consequently cheap; not liable to get out of order, and it can be made and repaired by any handy tin-man. It can be applied to any description of tank or reservoir, and the number of the discharges per day or per week can be accurately regulated. The principal novelty that it presents, is the relieving of the discharge-valve at the bottom of the tank from the downward pressure of the water. Thus, in the machine which he has constructed for the North Dublin Workhouse, the valve opening is 10 inches in diameter, the pressure on which valve, with a head of 5 feet of water, is 340·8812 pounds, while the pressure on Dr. Gray's valve is only the weight of the valve itself, just sufficient to keep it steady and watertight in its seat. Dr. Gray has also made a most successful application of vulcanised India-rubber as a substitute for the common ball cock, and by means of which he can also regulate the supply of water to the tank with the greatest precision. This new cock and regulator will be understood by reference to fig. 6. P is the end of the supply-pipe entering the tank. S is a small brass pipe attached by a chain to a cylindrical float. V is a tube of vulcanised India-rubber drawn over the ends of the pipes, P and S, and secured there by strings binding it to the ends of the pipes. The ends of the pipes are regulated so as to be distant from each other about a diameter and a half of the India-rubber tube. When the float, F, rises

by its buoyancy on the water in the tank, it carries with it the pipe, S; the India-rubber tube is deflected in proportion as the water rises, until by means of such deflection no more water can pass through it into the tank. I have myself applied this contrivance, with Dr. Gray's permission, to a tank in connection with a small steam engine, and I find that it answers admirably; far better than the old ball cock. Fig. 2; A, C, D, is a cylindrical chamber made of tin, open at the top, and closed by a cylindrical ring at the bottom.

Fig. 2.

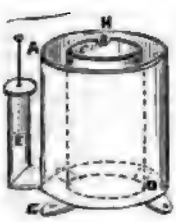


Fig. 5.

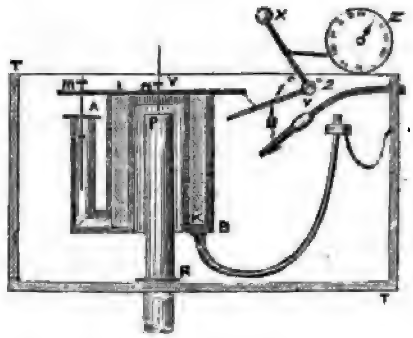
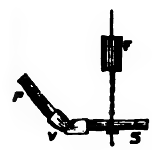


Fig. 6.



E is a tube, equal in diameter to the distance between the walls of the cylindrical chamber. This tube, E, rises to within 2 inches of the top of the side of the cylindrical chamber, and there is an opening between it and the bottom of the chamber. The diameter of the opening and the diameter of the tube should be equal. G G, are lugs projecting from the bottom of it, to secure it to the stand in the tank.

Fig. 3; I K, is another cylindrical vessel, called the "float," and made to fit easily between the walls of the float chamber, fig. 2. *Both* ends of the "float" are closed water-tight by rings of tin soldered on them. The float carries a cross of light iron soldered to the top of it, one of the arms of which, M, projects 4 inches beyond the side. The arms, N and O, project 2 inches each.

Fig. 4; P R, is the valve cylinder made of tin, the diameter of which is equal to the diameter of the opening of the valve seat in the bottom of the tank.

Fig. 4.

Fig. 3.

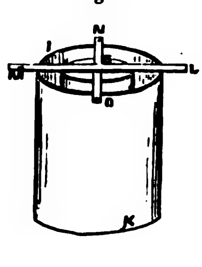


Fig. 5 is a perpendicular section through the centre of the machine, the different parts being shown in their proper places in the tank. The valve R (fig. 4) is placed on its seat in the bottom of the tank, the guide-rod, V, passing through in a transverse bar secured a few inches below the valve seat. The float chamber, fig. 2, is placed on its proper stand in the tank (not given in the engraving), so as that the top of the chamber shall be a few inches below the edges of the tank. The float, fig. 3, is placed within the float chamber, so as to allow the top guide-rod, V, of fig. 4, to pass through the opening, S, in the cross bars, fig. 3; and the holes, O and N, to pass over guide rods attached to the sides of the float chamber, fig. 2, at H H, and the hole, M, fig. 3, in the projecting arm of the cross bars, admits through it the spindle, A E, fig. 2, of the trigger-valve that sits on the top of the side tube, A, E, F.

X Y is a lever bent at right angles, whose fulcrum is at Y, and which vibrates between the studs, 1 and 2, fig. 5; its upright arm, is weighted with a ball of metal, and from this arm is carried a wire rod connected with and operating on the ratchet-wheel of the register, Z. From the bottom of the float-chamber projects a brass tube 2 inches long, and ½ of an inch in diameter. An India-rubber tube is fastened at one of its ends to this small brass tube, and the other end of the India-rubber tube is fastened to a similar short brass tube that pierces a cork-float. The cork is secured by a light brass chain to the end of the tank, so as to prevent its being carried forward by the rush of the water towards the discharge-pipe when the tank is being emptied.

The *modus operandi* is thus:—When the water flows into the tank from the supply-pipe, as it fills the tank the cork floats, carrying the top of the brass pipe above the surface of the water. The tank continues to fill until it reaches nearly two inches above the trigger-valve, and commences flowing over the lip of an indenture cut out of the inside wall of the float-chamber, O, fig. 2. As the water flows over the lip into the float-chamber, the float gradually rises by its buoyancy until the cross bar, M, comes in contact with a button screwed to the top of the spindle of the trigger-valve. As the float still continues to rise gradually, the trigger-valve is lifted from its seat, when there is a *sudden* influx of water, through the tube and into the float-chamber, causing the float to rise with a jerk, and the cross-bar hits the button screwed to the top of the guide-rod of the cylindrical valve, lifting it suddenly from its seat, and allowing the tank to discharge its contents. The cross-arm at N, (fig. 3), at the same time lifts up the lever by means of a chain, one end of which is fastened to the cross-arm, and the other end to the lever. The upright arm of the lever is thrown from stud 1 to stud 2, the discharge is registered, and the long arm lifts up and deflects the India-rubber tube (not shown in the engraving), and prevents the influx of water from the supply-pipe. Now, if the water admitted through the trigger-valve were to remain in the float-chamber, the discharge-valve would remain suspended over its seat. But this cannot be, for the cork-float now lies at the bottom of the empty tank, and the water is gradually discharged through the India-rubber tube, allowing the discharge-valve to descend noiselessly to its seat, when, in so doing, the cross-arm, N, pulls down with it the arm of the lever, *un*-deflecting the India-rubber tube of the supply-pipe, and the tank commences being again filled.

I may mention in conclusion that the discharge-valve seat is made of crown glass, more lasting than metal, and twenty-five times cheaper.

Hoping the description of this very ingenious machine may be interesting to your mechanical readers,

I am, Sir, yours, &c.,

THOMAS LANGAN.

Prienstown-house, Garristown,
March 24, 1855.

RENTON'S METHOD OF MAKING MALLEABLE IRON DIRECT FROM THE ORE.

To the Editor of the Mechanics' Magazine.

SIR,—A few remarks upon the paper on *this subject*, extracted in your pages 17th *inst.* from an American work, may prove not unacceptable. The writer appears to be but little informed as to what has actually been done in England in the matter. As early as 1794 my late father commenced his experiments on the direct manufacture of malleable iron, leading the way to all who have followed; he was more or less engaged in prosecuting such experiments to the date of his decease, in 1847. He published many accounts of them, read papers, and exhibited specimens of produce, at the meetings of the British Association; and the patent of Clay, to which the above American writer alludes, was a very imperfect adoption of some of his processes, and proved entirely abortive in practice. By-the-bye, one of the localities of its failure, was at works erected by the late Sir Thomas Lethbridge, at the foot of the Brenden Hills, especially to operate on the dense hematite, much richer than the Cumberland ores, which has lately, in so extraordinary a manner, been publicly announced as a great and novel geological discovery. Soon after 1794, works on the deoxidating principle were attempted near Whitehaven, for the local hematites; and there has been no period, since my father first directed attention to this important question, in which there has not been more or less experimenting going forward in some quarter of the kingdom. My lamented and esteemed friend, Mr. Heath,—whose fate, as a victim to the ambiguities of patent-law interpretation, ought to be recorded in sable letters over the doors of every court of law and equity which played shuttlecock with his rights for eleven years, until death passed a sentence irreversible, before the admirable decision of the Court of Error on appeal was given,—had a patent connected with such manufacture prior to Clay, and another in 1850. Sir Francis Knowles, Bart., had a patent in the same year for gaseous deoxidation; and so far from any recent requisition of the physicians having led to the use of the reducing and carbonizing powers of gases, it is more than twenty years since, that Mr. Macintosh, of world-wide celebrity in all the elements, secured a patent for the conversion of steel by carburetted hydrogen gas, which, as a chemical process, was perfectly successful, but failed of practical extension from the difficulty of maintaining the gas-chambers tight under the high temperature required. During the last ten years I am cognisant of persevering attempts made in Lancashire to realize a process similar to Renton's; but the difficulties which my father indicated at the outset, no one has yet been able to conquer so as to establish a manufacture. There is no peculiar novelty in Renton's process, as described. If the workman, by dexterous manipulation, can bring forward the heated ore mixed with charcoal, and ball it in the

puddling-hearth without a prohibitory loss by oxidation, they will exhibit what practice in skilled labour can accomplish against difficulty; and as in such processes skilled labour is everything (witness the now universal puddling process of Cort, for instance), there can be no doubt Renton has done much towards ultimate manufacture if he has fairly established a good school. But it strikes me not much has yet been actually attained. Only *two* furnaces appear to be in operation. But the additional profit, as stated at the Society of Arts, over the ordinary manufacture, was 25 per cent. Now, as such air-furnaces do not take a great capital to erect, perhaps not much above £1,000 per dozen, it does seem strange that a company of our "cute cousins" should be satisfied to confine a 25 per cent. extra profit to the produce of *two* furnaces *only*.

I am, Sir, yours, &c.,
DAVID MUSHET.

March 27, 1855.

NEW AMERICAN POLYCHROMATIC PRESS.

To the Editor of the Mechanics' Magazine.

SIR,—A friend of mine, Mr. S. Brown, of Syracuse, New York, United States, has invented a printing-press of novel and admirable construction. It is capable of working off five hundred impressions per hour, in four colours, and one thousand impressions per hour on book work and plain jobbing. When printing in colours, its superiority over every other press consists in the fact that all the colours are worked at one impression; and it can be so arranged as to print shaded letters. Or a border can be worked all round a job in one colour, at the same time that the body of the form is of *different* colours. This is a desideratum in printing, and an immense advantage over the present plan of printing each colour at a separate impression. The inventor also thinks that the principle can be applied to calico printing; and if so, of course the invention would be invaluable in England, as it would save engraving, and the same materials could be used on different patterns of goods, on the plan of a combination border. I have seen a model of this novel press, and am satisfied its introduction will be a great boon to the disciples of the typographic art. I find that, since I left America, he has completed a press of medium size, and has found it to answer fully his expectations. It has been noticed favourably by several American journals, and some English; but I do not know that the invention has been noticed in your Magazine. If you should think the matter worth a notice, you will perhaps announce the discovery to your readers. I enclose a notice clipped from the *Wesleyan*, a weekly Syracuse paper.

The inventor wishes to negotiate with some English capitalist who would be willing to buy *one-half* the right, and take out patents in England and France for the purpose of manufacturing them.

I am, Sir, yours, &c.,
J. G.

March 29, 1855.

AN IMPROVED LOCK.

To the Editor of the Mechanics' Magazine.

SIR,—Notwithstanding the vauntings of sundry persons, that grand desideratum, both for domestic and commercial security, a perfect lock, still remains, in my judgment, unaccomplished. Many, it is true, have been offered to the public, with high recommendations from their inventors, and much boasting; but, on being submitted to the test of a skilful picklock, all have more or less yielded, and have failed to gain public confidence. Under these circumstances it will, perhaps, be deemed presumptuous in one not by profession either a locksmith or a lock-picker, to offer another lock for trial, which unites the great advantages of simplicity and cheapness, and to challenge any persons interested in such matters to pick it. This, however, I fearlessly do; the trial to last for two consecutive hours, in my presence and that of respectable witnesses willing to certify the success, or—as I confidently hope—failure of the attempt; stipulating that the lock prepared for the purpose—a small four-inch one—shall be left uninjured, so that the key shall still pass in without impediment. The invention being still unregistered, I am prevented for the present from giving any minute description, but may add that the lock may be made of any size or shape, and without steel or springs—two great advantages, because it is thereby freed from liability to damage by corrosion.

I am, Sir, yours, &c.,
SAMUEL LONG,
Watchmaker, Putney.

March 29, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

FORBES, CHARLES WENTWORTH, of Barsley, Hants, gentleman. *An improved rest for fire-arms.* Patent dated September 12, 1854. (No. 1985.)

Claims.—1. The employment as a rest for fire-arms of a line, cord, or strap, held in a state of tension by the force of upward pressure applied to the fire-arm. 2. The employment of a spring, or self-winding

reel, for containing a line, cord, or strap, to be employed as a rest for fire-arms.

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *Improved machinery for making screws.* (A communication.) Patent dated September 14, 1854. (No. 1996.)

The inventor describes a machine in which a movable head turns the blank, cuts the thread, and severs the finished screw from the rod. The bed slides backward and forward on the lathe frame, being advanced towards the feed-end of the machine by means of palls and of a ratchet worked by a lever under control of the workman.

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *Machinery for making lock-springs.* (A communication.) Patent dated September 14, 1854. (No. 1997.)

Claims.—1. A method of dividing lock-springs into strips or fingers, and particularly of giving regularity to the division, by means of an arm and a pin moving over an adjustable graduated plate. 2. A method of flattening and compressing the divided spring, by means of vertical and lateral percussion.

STANSBURY, CHARLES FREDERICK, of Cornhill, London. *Improvements in punches and dies.* (A communication) Patent dated September 14, 1854. (No. 1998.)

The inventor forms of rods of steel punches, which are hardened, tempered, and fitted into stocks or holders of steel or other metal, the punches being held in their places by binding-screws or otherwise. These stocks or holders are then fixed to a solid block or bed-piece of metal.

WILSON, ALFRED, and GEORGE WILSON, of Nottingham, hosiery manufacturers. *Improvements in knitting machinery.* Patent dated September 14, 1854. (No. 1999.)

This invention relates to rotary knitting or stretching frames.

Claim. — Combining the wheel used for sinking the threads between the needles, and the wheel for pressing the beards of the needles, with apparatus for causing them to work to and fro on the needles of a certain needle-bar; and combined therewith the application of a narrowing apparatus.

ADAMS, ROBERT, of King William-street, London. *Improvements in machinery for boring and rifling the barrels of fire-arms.* Patent dated September 14, 1854. (No. 2000.)

For the purpose of boring barrels, a self-acting lathe is used, having applied thereto a hollow boring tool, arranged in such manner, that, by means of a small force pump (put in motion by the lathe or by a head of water above the machine), water is caused to flow through the boring tool or cutter, by which means the boring of a barrel is rendered continuous, the cutting tool not requiring to be drawn back from time to time, as heretofore, the flow of water removing the cuttings as they are produced from the barrel. The barrel is rifled by a self-acting machine which stops itself, its cutter ceasing to act as soon as the required extent of cut has been accomplished.

HAYES, WILLIAM BRAMWELL, of Manchester, Lancaster, manufacturer. *Certain improvements in looms for weaving.* Patent dated September 14, 1854. (No. 2001.)

This invention consists, *firstly*, in the arrangement of, and in the method of working a series of movable shuttle boxes, whereby the inventor is enabled to employ a number of shuttles succeeding each other in a prescribed order, and performing their operations at stated intervals without interruption to the action of the loom, so that by charging such shuttles with weft of different kinds or colours a pattern may be produced in the fabric. *Secondly*, in a method of suddenly arresting the advance of the sley and stopping the loom in the event of the shuttle failing to complete its transit through the shed in due time, and in a combination of mechanical parts for that purpose, constituting a "stop rod" or "protector." *Thirdly*, in a peculiar form and construction of a "break" to be applied to the fly-wheel for the purpose of mitigating the shock consequent upon the sudden stoppage of the machine, by the action of the stop rod or otherwise.

PURDON, THOMAS, of Hull, ironmonger. *Improvements in safety-lamps.* Patent dated September 14, 1854. (No. 2003.)

This invention consists in the use in safety-lamps of glasses, protected on one or both sides by a sheet or sheets of talc; in the use of a reflector in combination with a double-gauge diaphragm, enclosing only a small portion of the lamp in place of entirely surrounding the flame; &c.

RAWLINSON, ROBERT, of Westminster, civil engineer. *Improvements in valves or adjustable thoroughfares.* Patent dated September 14, 1854. (No. 2004.)

The inventor employs a ball, buoyant in water, arranged inside a pipe or valve-chest in such a position and manner that when it is exposed to pressure from below it rises and presses with its upper side against a valve seating above.

EVANS, GEORGE FREDERICK, of Hanover-lodge, Kew-bridge, Middlesex, gas engineer, and FREDERICK JOHN EVANS, of the Gas-works, Horse-ferry-road, in the same county, gas engineer. *Improved apparatus to be used in the distillation of coal and other bituminous or resinous substances.* Patent dated Sept. 14, 1854. (No. 2005.)

This invention consists in coating the retorts internally with an enamel or glaze, which will prevent the gas from escaping through the pores of the retort, and will also, by presenting a smooth surface, prevent the carbon from adhering and forming a crust.

PERKINS, JOHN WILLIAM, of Poplar-terrace, High-street, Poplar, Middlesex, analytical chemist. *Improvements in purifying gas, the residuum arising from which forms a new artificial manure.* Patent dated September 15, 1854. (No. 2007.)

The inventors propose to effect the purification of carburetted hydrogen gas from coal, by the more perfect absorption of the nitrogenous and other gaseous compounds, whilst in a nascent state, whereby the ammoniacal gases formed are at once absorbed by acid and metallic phosphates of lime, placed in the purifiers for that purpose, the said phosphates being converted into neutral phosphates of lime, phosphate of ammonia, and sulphate of ammonia, or muriate of ammonia, as the case may be, thus producing an artificial manure, &c.

BARCLAY, ANDREW, of Kilmarnock, Ayr, engineer. *Improvements in refracting and reflecting telescopes.* Patent dated, September 15, 1854. (No. 2008.)

This invention consists in using in refracting telescopes an intermediate lens or combination of lenses, inserted between the object lens or lenses and those constituting the eye-piece (comprehending under the term "eye-piece" any lenses for merely reinverting the image, or for bringing it into an erect position for being viewed by the actual or ultimate eye lens, as used in ordinary telescopes); in a mode of constructing refracting and reflecting telescopes, wherein a lens or combination of lenses is placed in, or nearly in, the first focus of the telescope, for the purpose of reinverting the image, such lens or lenses being used in combination with others which converge the visual rays to a second image focus; and in the use in reflecting telescopes of an object lens or lenses, placed in front of the primary or first reflecting mirror.

COLLINS, SAMUEL, of Birmingham, Warwick, brass-founder. *A new or improved castor for furniture.* Patent dated September 16, 1854. (No. 2009).

This invention consists in placing a plate upon the axis of the castor between the horn and the bottom, the horn being made to bear against the edge of the plate, and both horn and plate having motion upon the axis of the castor.

ASHWORTH, JOHN, of Bristol, manager of Great Western Cotton Works. *Certain improvements in sizeing and stiffening textile materials or fabrics.* Patent dated September 18, 1854. (No. 2012.)

The inventor employs a mixture composed of 34 lbs. of glue, glue substitute, (or other gelatinous matter), 60 lbs. of soap, 20 lbs. of salt or saltpetre, 5 lbs. of isinglass, and 20 lbs. of ordinary wheat-starch.

THOMPSON, NATHAN, jun., of New York, United States of America. *Improvements in life-preserving seats.* Patent dated September 18, 1854. (No. 2013.)

The inventor constructs a seat in such manner, that when it is laid upon its side, and the body of a person is pressed against certain water-tight compartments formed in connection with it, they may open out and permit the body to pass between them, and then re-assume their former positions by the action of springs.

CRABTREE, SAMUEL, of Bradford, York, manager. *Improvements in machinery for combing wool, hair, and other fibrous substances.* Patent dated September 18, 1854. (No. 2017.)

This invention consists in imparting to the rotating taking-combs of combing machinery an independent axial motion for the purpose of transferring the fibres to the circular comb.

DAWES, WILLIAM HENRY, of Handsworth, Stafford, ironmaster. *An improvement in the manufacture of iron.* Patent dated September 19, 1854. (No. 2019.)

Claim.—The combination of the processes of squeezing and hammering in the manufacture of blooms or slabs of iron.

CUNNINGHAM, JOHN, of Beith, Ayr, card-perforator. *Improvements in the preparation or production of printing surfaces.* Patent dated September 19, 1854. (No. 2021.)

The inventor describes certain improvements upon Graham's patent, dated February 6, 1854, and upon his own, dated August 5, 1854.

PORTER, JOSEPH, of Salford Screw Bolt Works, near Manchester, Lancaster, engineer and tool-maker. *Improvements in machinery for cutting, punching, forging, and forming nuts, bolts, screws, and various other articles in metal.* Patent dated September 19, 1854. (No. 2022.)

In forming nuts, for example, by his improved machinery, the inventor takes a bar of metal, and having placed it in the machine, certain slides or rams, carrying suitable dies, close upon it, and cut off enough of it to make a nut, shaping the sides in the operation; the dies then retire, leaving the partly-formed nut over another die of the size and shape required, into which it is compressed by a descending ram, that has fixed in it a punch, which gives shape to the upper side, and pierces the hole.

KERSHAW, JAMES, of Bury, Lancaster, overlooker. *Improvements in looms for*

weaving. Patent dated September 19, 1854. (No. 2023.)

Claims—1. Communicating motion to the picking-sticks of looms by the vibration of shafts situate crosswise in the loom, such shafts being actuated by cams upon the tappet or other second-motion shaft. 2. The application of screws and nuts for shortening or lengthening the connections with the picking-sticks.

TYLOR, ALFRED, of Warwick-lane, Newgate-street, London, and HENRY GEORGE FRASI, of Herbert-street, New North-road, Middlesex. *Improvements in water-closets.* Patent dated September 20, 1854. (No. 2024.)

This invention consists in certain improvements in the construction of valves, in connection with a closed vessel for regulating the supply of water to water-closets, so as to prevent waste; and in having the trap and container of one piece of earthenware, the pan or valve working in the trap or container.

GEE, WILLIAM, of Birmingham, Warwick, stamper and piercer. *An improvement or improvements in the manufacture of braces used for boring, driving screws, and other such like purposes.* Patent dated September 20, 1854. (No. 2025.)

Claim.—Making braces used for boring, driving screws, and other such like purposes (and commonly called joiners' braces) hollow, and of sheet metal.

BILLING, MARTIN, of Birmingham, Warwick, stationer, and WALTER GEORGE WHITEHEAD, of Birmingham aforesaid, accountant clerk. *A new or improved waterproof paper.* Patent dated September 20, 1854. (No. 2026.)

Claim.—A new or improved waterproof paper, made by spreading upon paper, or impregnating paper with, marine glue.

ROBINSON, JAMES, of Huddersfield, York, manufacturing chemist. *Improvements in apparatus for generating steam and gas, and consuming smoke.* Patent dated September 20, 1854. (No. 2027.)

Claim.—"An apparatus for generating steam and gas, constructed and arranged so that the smoke or combustible matter will descend through and from its own fire and fire-bars, or through its own fire and fire-bars and other fires in succession, thus establishing a downward current or draught."

PIERRET, VICTOR ATHANASE, of Paris, France, and of Old Compton-street, Soho, Middlesex. *Improvements in watches and clocks.* Patent dated September 20, 1854. (No. 2029.)

The inventor describes arrangements of independent mechanism, to be applied to watches and clocks, for the purpose of indicating the months of the year, the days of the month, and the days of the week.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in machines for drilling stone.* (A communication.) Patent dated September 20, 1854. (No. 2032).

The patentee employs a dog, trigger, chain, and a catch block, fitting loosely to the drill or its bar, for laying hold of, raising, and releasing the drill, the chain being driven by cranks or other suitable means, and the trigger being operated upon by coming in contact with fixtures on the framing of the machine, &c.

COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

NESMITH, JOHN, of Lowell, Massachusetts, United States of America, manufacturer. *The manufacture of wire netting and wire fence by power.* Application dated December 13, 1854. (No. 2617.)

This invention consists in certain means of revolving the wires for the purpose of keeping them parallel to each other, so that they may not get entangled during the process of making the netting or fencing; in vibrating the wires alternately from one side to the other, before or after, or at the time of twisting them; &c.

DAY, WILLIAM CHARLES, of the Strand, Middlesex, camp-equipage maker. *Improvements in portable camp-bedsteads and bedding.* Application dated December 14, 1854. (No. 2634.)

The improvements in bedsteads relate to the combination of a folding bedstead or part of it, with a portmanteau or other travelling-trunk or case, so that the latter forms part of the bedstead; and the improvements in bedding consist in the employment of sheepskins for it.

DONALD, WILLIAM, and WILLIAM HIGINBOTHAM, power-loom managers for John Ferguson and Co, of Carlisle, Cumberland. *Certain improvements in looms.* Application dated December 20, 1854. (No. 2683.)

In the improved looms the vibration of the yarn-beam, which causes breakage in the warp threads, is done away with, by means of a metal clip or friction-strap which is made in two pieces, each piece embracing one-half of the yarn-beam.

SHIPLEY, SAMUEL SMITH, of Stoke Newington, Middlesex. *Improvements in fittings suitable for dressing-cases and for other purposes of elegance and utility.* Application dated December 30, 1854. (No. 2764.)

This invention consists in the employment of certain tubes and covers containing a shaving-brush, tooth-brush, nail-brush, shaving-soap, tooth-paste, &c., &c.

FRASCARA, EPAMINONDA, of Alessandria, Piedmont, now of Alfred-place, Bed-

ford-square. *A voltaic pile, and of the application of its electric fluid, either to the decomposition of water, or to enable the gases to replace the steam power actually in use.* Application dated January 1, 1855. (No. 1.)

The new pile is of the same form as those now in use, the invention consisting only in substituting for the ordinary porous diaphragm which separates the two liquids now in use, a paper treated with concentrated nitric acid.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Improvements in tanning.* (A communication.) Application dated January 12, 1855. (No. 79.)

Claim.—" The use of the peroxya of iron for tanning hides and skins, by causing said peroxya to form a stable compound with gelatine."

DEN BERGH, CHARLES VAN, of Lacken, by Brussels. *Improvements in rotatory steam engines.* Application dated January 20, 1855. (No. 154.)

An illustrated description of this invention will probably be given hereafter.

LAMACROFT, JOHN, of Westbourne-grove, Middlesex, engraver. *Improvements in envelopes or means for securing letters, notes, and similar documents.* Application dated January 26, 1854. (No. 196.)

The inventor describes an envelope in which the tongue or lappet is passed through each of the other three folded portions, so that the envelope cannot be opened without mutilation.

MAYER, SAMUEL, of Bristol, potter, and WILLIAM BUSH, of the same city, millwright. *Improvements in reducing flint and other substances, rendering them suitable for the manufacture of porcelain and other earthenware articles.* Application dated January 27, 1855. (No. 208.)

The inventors employ a pair of fixed fluted, or corrugated rollers, beneath which they place a pair of plain ones, and under these a hopper to receive the product reduced by the action of the rollers. This product is then passed on to a pair of grindstones to be ground finer, and then borne by a current of water to another pair, whence it passes into the receiver.

LENOIR, AUGUSTE LEOPOLD, of Paris, France. *Improvements in breech-loading fire-arms.* Application dated January 27, 1855. (No. 218.)

Claims.—1. A spring hammer for firing the charge in the inside of the gun, the said hammer being hooked or caught by a detent spring when cocked. 2. The use of a hinged breech cover for cocking the hammer, and partly covering the hinder breech mouth. 3. The use in breech-loading fire-arms of a system of cartridges, the essential features of which are, a paper or pasteboard bottom, and a central needle, which fires the fulminating matter between the powder and the projectile.

SOELMAN, WILLIAM, of Bennett-street, Fitzroy-square, gentleman. *An invention applicable to shipping and mills, under the title of the Naukinetic or ship-moving machine.* Application dated February 2, 1855. (No. 249.)

The inventor describes a modified form of screw propeller and machinery for driving it, the latter being worked by manual labour, or by means of a windmill which resembles the propeller in form, or by both combined.

REDDIE, JAMES, of Anstruther, Fife, ironmonger. *An improved metal shovel.* Application dated February 28, 1855. (No. 434.)

This invention consists in constructing of iron or other metal a shovel of the form of the ordinary wooden shovel employed for lifting herrings.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

CAMPBELL, WILLIAM MUIR, of Glasgow, Lanark, furnace builder. *Improvements in furnaces or fire-places, and in the prevention of smoke.* Application dated September 13, 1854. (No. 1989.)

This invention consists in introducing air at the back of the fire space, by means of pipes of metal or earthenware laid for some distance inside the flues, so that the air may become heated before it mixes with the gases.

BROOKES, JOHN, of Birmingham, Warwick, manufacturer. *A new or improved waistcoat.* Application dated September 13, 1854. (No. 1991.)

The inventor describes a waistcoat having, among other peculiarities, two collars, of which the lower forms an elliptical opening that displays the front of the shirt advantageously, and gives a bulged or convex form to it.

DURANT, ANGUISH HONOUR AUGUSTUS, esquire, of Tong Castle, Salop. *A new or improved axle and axle-box, to be called the anateiros or antifriction axle, which said axle and axle-box may be used for wheel-carriages and for a shaft or axle, and bearings for machinery in general.* Application dated September 13, 1854. (No. 1992.)

The working part of this axle consists of a cylinder in which a number of broad grooves are cut, so as to diminish the bearing surface, and the axle-box consists of a hollow cylinder fitting the axle.

BETTELEY, JOSEPH, of Liverpool, Lan-

caster, anchor manufacturer. *Improvements in giving elasticity to ships' standing rigging.* Application dated September 13, 1854. (No. 1993.)

The object of this invention is to give elasticity to wire rope and other standing rigging, and consists in attaching India-rubber or other springs to the lower ends of the stays and fastening it to the ship's side, in place of the present rope lanyards.

HOSSACK, JOHN, of Manchester, Lancaster, engineer. *Improvements in machinery or apparatus for measuring the flow of water or other liquids and fluids.* Application dated September 13, 1854. (No. 1995.)

In carrying out this invention, rollers are so placed on certain discs as to flatten a flexible tube against the curved plate, so that as the fluid is passing through the tube it forms a kind of wedge, and thus gives motion to the discs, to indicate the quantity that passes through.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture of boots and shoes or other coverings for the feet.* Application dated September 14, 1854. (No. 2002.)

This invention relates to the cutting out or shaping of the heels of boots and shoes by means of partially self-acting machinery.

FONTENAU, FELIX, of Paris, France, gentleman. *An improved mode of preventing mud from touching or adhering to carriages.* Application dated September 15, 1854. (No. 2006.)

This invention relates to a contrivance for causing the mud collected upon wheels of carriages, when in motion, to fall to the ground, and consists of a metallic or other rod, terminated by a flat part, lined at discretion with felt or other material and of the same breadth as the felloe of the wheel, attached to the carriage in such a position as to reach down to the back part of the wheel.

HARRISON, JOSEPH, machinist, JOHN ODDIE and JOHN EAVES, mechanics, and HENRY GRAHAM, power-loom manager, all of Blackburn, Lancaster. *Improvements applicable to machines for warping, sizeing, or otherwise preparing yarns or threads for weaving.* Application dated September 16, 1854. (No. 2010.)

The mechanism or apparatus employed by the inventors "consists of a series of needles combined together in the comb-form, having hooked or forked ends, or a comb having short and long slits, which, when a lease is required, are inserted in the warp, so as to push or draw from the warp those threads required to be separated from the others."

SIMPSON, WILLIAM, of Birmingham, Warwick, agricultural implement manufacturer. *An improvement or improvements in beams or girders for bridges and other structures.* Application dated September 18, 1854. (No. 2011.)

This invention consists in the combination of a triangular beam with a tubular beam or girder, and in a method of connecting the two together.

THORNE, GEORGE, and SAMUEL LEMON, both of Fore-street, city, London, gas-light furniture manufacturers and brass-founders. *Improvements in facia-boards, sign-boards, or name-boards.* Application dated September 18, 1854. (No. 2014.)

This invention consists in illuminating facia-boards, sign-boards, or name-boards, by means of a series of fixed lanterns.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improvements in tuning-keys for pianofortes and other stringed musical instruments.* (A communication.) Application dated September 18, 1854. (No. 2015.)

This invention consists in combining the spindle of the handle with the socket which fits on to the pins of the piano or other instrument, by means of cog-wheels or other suitable gearing, so that the two shall have their axis in, or nearly in, the same line, whilst the interposed gearing enables the handle of the key to turn faster than the socket, and thus the tuner to turn the pins with facility.

SMAL, OSCAR DELLOYE, manufacturer, of Huy. *A new system of oven for metals.* Application dated September 18, 1854. (No. 2016.)

This invention relates to a novel construction of oven adapted for the heating of metals and alloys of metals, preparatory to their being subjected to the action of rolls. Above the fireplace are two heating chambers, placed one over the other, and severally connected with the fireplace by sets of side-flues, which conduct the flame and gases upwards to them.

LEWIS, THOMAS, and ABRAHAM BARTLE, of Birmingham, Warwick, machinists. *Improvements in apparatus for purifying water.* Application dated September 18, 1854. (No. 2018.)

The inventors employ a boiler with a furnace underneath, a pipe to supply the impure water, and a steam-pipe to carry off the vapour to the condenser, which is a cylinder provided with proper stop-cocks, &c. The steam-pipe terminates in a coiled pipe passing through this cylinder, the cylinder being kept charged with cold water which, by means of an ingress and egress-pipe, is kept constantly running.

PIERCY, GEORGE, and GEORGE COLLINS, of Judd-place West, New-road, Middlesex,

bath manufacturers. *Improved apparatus for heating and supplying heated liquids to baths, useful also for supplying heated liquids for other purposes.* Application dated September 20, 1854. (No. 2020.)

The inventors employ a cylinder near the bottom of which is a plate in which are inserted a number of tubes for the fire to pass through to the top of the cylinder where it heats a pan containing a regulated supply of water already heated by passing between the tubes.

GARNETT, WILLIAM, of Low Moor, near Clitheroe, Lancaster, spinner and manufacturer. *Improvements in and applicable to machines for warping and sizeing yarns or warps.* Application dated September 20, 1854. (No. 2028.)

This invention consists in an improved instrument composed of a comb with teeth somewhat like the dents of a reed, for separating the yarns forming a warp, or as it is technically called, "taking a leese," to facilitate the operation of joining a fresh warp to the end of one that has been woven into cloth.

PROVISIONAL PROTECTIONS.

Dated December 18, 1854.

2661. William Gilpin, of Moorgate-street, London, and Abraham Bowen, of Stafford-street, Peckham, engineers. A new method for the effectual consumption or prevention of smoke, and the more perfect combustion of coals and other fuel by means of a mechanical apparatus and furnace-bars of a certain construction; a portion of the same may be applied for raising water, and in furnaces where blast is required.

Dated January 17, 1855.

126. John Slack, of Manchester, Lancaster, manager. Improvements in the manufacture of velvets, velveteens, cords, and other woven fabrics, in which floated threads or loops are formed, for the purpose of being cut.

Dated February 16, 1855.

351. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. A means of preparing the fibres of certain plants of the bean species in order to form them into pulp, and to fit them for other manufacturing purposes. A communication.

Dated February 28, 1855.

432. Thomas Helliwell, of Greenhirst Hay, near Todmorden, York, cotton-spinner and manufacturer, and Joseph Barker, of Houghstone Mill, near Todmorden, manufacturer. Preserving pickers and picker-sticks, and for preventing cops being knocked off the spindle in the shuttle during the process of weaving in the power-loom.

Dated March 10, 1855.

541. Alexander Clark, of Gate-street, Lincoln's-inn-fields, Middlesex, engineer. Improvements in the construction and manufacture of celestial and terrestrial globes for the study of astronomy and geography.

542. John Hughes, of Uskside Iron Works, Newport, Monmouth. An improvement in bushing the touch-holes of cannon.

544. Charles Heaven, of Hull. Improvements in machinery used for embroidering fabrics.

545. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in machinery for making butt-hinges of wrought iron or other metal complete at one operation. A communication.

Dated March 12, 1855.

547. Joseph Malcomson, of Portlaw, Waterford, Ireland, merchant, Robert Shaw, of the same place, merchant, and William Horn, of Mark-lane, London, engineer. Improved expansion valves for steam engines.

549. John Brookes, of Birmingham, Warwick, manufacturer. A new or improved waistcoat.

551. George Mosley, of Southwark, Surrey, button-maker. An improvement in buttons.

553. William Prockter Stanley, of Peterborough, Northampton, agricultural implement maker. An improvement in or addition to clod-crushers.

555. James Murdoch Napier, of York-road, Lambeth, Surrey. Improvements in the furnaces used in the manufacture of soda or alkali.

Dated March 13, 1855.

559. Thomas William Willett, of Belsize-road, St. John's Wood, Middlesex, civil engineer. Certain improvements in swimming-belts.

561. John Gracie, of Stanley-terrace, London-road, Rotherhithe, Surrey. Improvements in wood-planing machines.

563. Charles Iliffe, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of metallic rods, bars, and tubes.

Dated March 14, 1855.

564. Richard Campbell Green Cooke, of New Swindon, Wiltshire, gentleman. Improvements in military and other cloaks.

565. George Riley, of Portland-place North, Clapham-road, Surrey. An improved process for the manufacture of starch or grape sugar.

566. Henry Gray, of Clement's-lane, Strand, Westminster, printing ink manufacturer. Manufacturing from vegetable substances a material which can be applied to all adhesive surfaces for either useful or ornamental purposes, as a substitute for, and in the same manner as flock is now used or applied on adhesive surfaces.

567. Benjamin Goodfellow, of Hyde, Chester, engineer. Improvements in regulating the power for driving the pumps of hydraulic presses.

568. Robert Neale, of Cincinnati, United States of America, copper plate printer. Improvements in copper and other plate printing.

569. John Kidder, of Plaistow, Essex, gentleman. Improvements in the construction of castors.

570. William Galloway and John Galloway, of Manchester, Lancaster, engineers. Certain improvements in balancing or regulating the pressure on the slide valves of steam engines.

571. Jonas Marland, of Sun Vale Iron Works, Walsden, Lancaster. An improvement or improvements in the manufacture of rollers for drawing, spinning, doubling, and preparing cotton, wool, flax, and other fibrous materials, a part or the whole of which improvement or improvements are applicable to shaping metals for other purposes.

573. William Soelman, of Bennett-street, Fitzroy-square, gentleman. Improvements in propellers.

574. Edmund Johnson Mitchell, of Bradford, York, stuff merchant. An improvement in rollers employed in the washing of wool and linen, in the squeezing of sized cotton, warps, and other like purposes.

575. Joseph Turner, of Farringdon-street, Lon-

don, undertaker. An improvement in coffin furniture.

576. Julian Bernard, of Club Chambers, Regent-street, Middlesex, gentleman. Improvements in the manufacture of boots and shoes, or other coverings for the feet, and in the machinery connected therewith.

577. Charles Goodyear, junior, of Avenue Gabriel, Champs Elysées, Paris. Improvements in the plates of artificial teeth.

578. Richard Wright, of Richmond, York, bootmaker. An improvement in the construction of swords.

579. Abraham Davis, of Tottenham-court-road, Middlesex, gentleman. An improved polishing powder.

580. John Hetherington, of Manchester, Lancaster, machine-maker, and Archibald Vickers, of Bristol, Gloucester, cotton-spinner. Improvements in machinery for preparing, spinning, and doubling cotton and other fibrous materials.

581. William Lister, of Dunsa Bank, near Richmond, York, farmer. An improved implement for raising or loosening turnips and other roots in the ground, and cutting off the tails thereof.

Dated March 15, 1855.

582. Henry Bach, of Sheffield, York, hosier. Improvements in sash-frames.

584. Robert Moore Butt, of Fairfield Works, Bow, Middlesex. Improvements in the manufacture of night-lights.

585. Edward Humphrys, of Deptford, Kent, engineer. Improvements in applying heat to steam-boilers.

586. François Loret-Vermeersch, of Malines, Belgium, civil engineer. Stopping trains on railroads.

587. William Monday the younger, of the firm of Sollett, Monday, and Co., of Kingston-upon-Hull, York. Improvements in preparing, mixing, and grinding the various kinds of plumbago, graphite, or blacklead, either together or separate, and with or without other materials, for polishing, lubricating, and for other purposes, and in otherwise preparing the same for sale.

588 George Grignon, of Sutherland-square, Walworth, Surrey, gentleman. Certain improvements in the means of launching or detaching boats from ships' sides or davits, and in the apparatus and tackle to be used for that purpose, that the operation may be speedy, spontaneous, and safe.

589. Henry Wickens, of Tokenhouse-yard, London, gentleman. Improvements in the means of communicating signals in railway trains.

Dated March 16, 1855.

590. Joseph Mitchell, engineer, of Lansdown-road, Sheffield, York. Supplying grease, tallow, or oil, either with or without the addition of blacklead, to locomotive engines, horizontal, and beam engines, marine engines, and Nasmyth's patent steam hammer.

591. William Hill, of Birmingham, Warwick, tool-maker. Improvements in metallic pens and penholders, and in ornamenting metallic pens and penholders.

592. Mark Smith, of the firm of William Smith and Brothers, of Heywood, Lancaster, power-loom-makers. Improvements in looms for weaving.

593. John Walter Cawley Wren, of Tottenham-court-road, Middlesex, iron bedstead manufacturer. An improved construction of invalid bed.

594. Thomas Picton, of Liverpool, Lancaster, wheelwright. Improved apparatus for erecting and supporting scaffoldings or stages, and which is also applicable as a fire-escape.

595. William Winstanley and Joseph Kelly, of Liverpool, Lancaster, engineers. Improvements in the construction of force-pumps and their appurtenance.

596. Armand Mauduit and Fréderic Hyppolyte Ouin, of Paris. An hydraulic machine.

597. Sir William Burnet, knight, of Somerset-house, and John Weir Draper Brown, R.N., of Haslar Hospital, Gosport. Improvements in constructing signal-lanterns.

Dated March 17, 1855.

598. Tony Petitjean and Louis Pètre, of Upper John-street, Tottenham-court-road, London, civil engineers. Certain improvements in the manufacture of daguerreotype plates and of electro-plated sheets of metal, part of which improvements may be applied to the production of polished surfaces on metallic articles. A communication.

599. Eugène Breittmayer, of Paris, France. A new or improved mortising machine.

600. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the application of carbonic acid gas as a motive power. A communication from Joseph Ghilliano, of Marseilles, France, chemist, and Henri Cristin, of the same place, gentleman.

601. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in steam engines. A communication from Narcisse Duvoir, of Liancourt, France, mechanical engineer.

602. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in steam pressure and other indicators. A communication from Louis François Clement Breguet, of Paris, France.

603. Thomas George Shaw, of Old Broad-street, London, merchant. Improvements in apparatus to facilitate the "tilting" of casks, barrels, or other similar vessels of capacity.

Dated March 19, 1855.

604. Bashley Britten, of Anerley, Surrey, gentleman. Improvements in projectiles.

606. George Lowry, of Manchester, machinist. Improvements in lubricators.

608. Edmund Reynolds Fayerman, of Pall Mall, Middlesex, gentleman. Improvements in portfolios for holding papers.

610. Vincent Scully, of Dublin, esquire, and Bennett John Heywood, of the same place, gentleman. An improved mode of regulating the supply of gas to gas-burners.

612. Felix Alexis Chartraire, glove manufacturer, of Paris, France. A new apparatus for fastening gloves, collars, shirts, and other similar articles.

614. Louis Henry Crudner and Frederic Louis Koebrig, of Tottenham-court-road, Middlesex. An improved apparatus for purposes of ventilation.

616. Richard Edward Hodges, of Southampton-row, Middlesex, and Charles Murray, of Manor-place, Walworth, Surrey. Improvements in door-springs.

618. William Smith, of Little Woolstone Penny, Stratford, Bucks. Improvements in ploughing or trenching and subsoiling land.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April 3rd, 1855.*)

2467. Stephen Shaw. An improved mode of marking metal plates for riveting or bolting, and the application of a new material as a template for receiving such marks.

2483. Riley Cunliffe. Improvements in machinery or apparatus for making or manufacturing bricks and tiles or other similar articles.

2497. Peter Armand Lecomte de Fontainemo-

reau. Improvements in the construction of inkstands. A communication.

2502. John Clarke. Improvements in the manufacture of looped fabrics.

2506. Charles Peterson. The application of a new vegetable substance to the manufacture of textile fabrics and pulp for paper, cardboard, papier maché, and similar purposes.

2519. John Mason and Leonard Kaberry. Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.

2520. William Taylor. Improvements in steam boiler and other furnaces.

2524. Ellis Rowland and James Rowland. Certain improvements in metallic pistons.

2526. Edward Briggs and William Souter. Improvements in machinery and apparatus for gassing yarn and thread.

2528. Julian Bernard. Improvements in the manufacture of boots, shoes, or other protectors for the feet, and in the machinery or apparatus connected therewith.

2556. John Henry Johnson. Improvements in the arrangement of electric telegraphs. A communication from M. Brequet.

2559. John Warhurst. Improvements in furnaces or fire-places applicable to apparatus for heating water and generating steam.

2593. Edward Maniere. Improvements in lamps. A communication from M. Chatel, jun., of Paris.

2605. Isaac Dodds. Certain improvements in machinery or apparatus for working the slide or steam valves of steam engines.

2614. William Chippindale. Improvements in steam boilers.

2626. Thomas Finnemore Evans. Improvements in the manufacture of candles. A communication.

2665. Thomas Hart. Improvements in Jacquard apparatus for weaving.

2693. William Greener. Improvements in repeating military rifles, carbines, and pistols, and in cartridges to be used therewith.

2700. Louis Joseph Frédéric Margueritte. Improvements in the manufacture of sulphuric acid.

2701. Louis Joseph Frédéric Margueritte. Improvements in the manufacture of caustic and carbonated potash and soda.

2710. Felix Marie Baudouin. Improved means of isolating and testing the isolation of the wires of electric telegraphs.

2721. Charles Edward White and Francis Robinson. Improvements in signalling for railway purposes.

2741. John Gray. Improvements in adjusting compasses on board ships or vessels.

2760. Robert Sam North. Improvements in switches and crossings for railways.

86. Christopher Turner. Certain improvements in power-looms for weaving.

147. Joseph Abbott and Henry Holland. Certain improvements in preventing the sinking of vessels at sea or on rivers, and in raising of sunken vessels.

153. Matthew Boulton Rennie. Improvements in preserving animal and vegetable substances for food. A communication.

357. James Wright. Improvements in the construction of furnaces for the purpose of consuming more effectually than heretofore the smoke contained therein.

362. John Robb and Laurence Hill. Improvements in the masts and spars of ships and vessels.

374. Frederick Blacket Edward Beaumont. Improvements in fire-arms called revolvers.

401. William John Macquorn Rankine and John Thomson. Improvements in machinery for laying subaqueous electrical conductors for telegraphic communication.

406. Benjamin Looker, junior. Improvements in ventilating stables and other buildings.

422. Thomas Nash, junior. Improvements in painting-brushes, applicable also to other brushes and to brooms.

471. Benjamin Dickinson and John Platts. Improvements in machinery or apparatus used in finishing woollen and other textile fabrics.

502. John Kennedy. Improvements in the manufacture of boots and shoes.

515. Antoine François Jean Claudet. Improvements in stereoscopes.

527. George White. Improvements in the treatment of horn and other substances of a similar nature. A communication.

529. James Bullough. Improvements in looms and apparatus for weaving.

541. Alexander Clark. Improvements in the construction and manufacture of celestial and terrestrial globes for the study of astronomy and geography.

548. David Hunter Brandon. Certain improvements in machinery or apparatus for cutting fustians and other piled fabrics. A communication from W. R. Harris and W. E. Baker, of the United States of America.

577. Charles Goodyear, junior. Improvements in the plates of artificial teeth.

582. Henry Bach. Improvements in sash-frames.

606. George Lowry. Improvements in lubricators.

608. Edmund Reynolds Payerman. Improvements in portfolios for holding papers

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed March 30, 1855.

2123. William McNaught.
2130. David Chalmers.
2147. John Macmillan Dunlop.
2149. Andrew Smith.
2168. George Wigzell Knocker.
2222. Jacob Dockray and John Dawson.
2467. Robert Gibson.
2647. Daniel Chandler Hewitt.
2684. William Milner.
2707. Edward Loysel.

1855.

156. Scipion Salaville.
221. Thomas Binks.

Sealed April 3, 1855.

2138. John Perry.
2157. Thomas Roberts and John Dale.
2165. Valentine William Hammerich.
2190. Arthur Dobson.
2197. John Coope Haddan.
2214. Lionel John Wetherell and Augustus Johann Hoffstaedt.
2234. Robert Walter Winfield.
2243. Thomas Allan.
2246. William Joseph Smith.
2261. Charles Cowper.
2264. Isaac Adams.
2270. William Henderson.

2285. Peter Armand Lecomte de Fontainemoreau.
2293. William Boutland Wilkinson.
2299. Charles Blake.
2305. John Coope Haddan.
2401. Antoine Édouard Brisbart Gobert.
2550. Edward Hammond Bentall.
2573. John Collis Browne.

1855.

263. Godfrey Pattison.
280. John Henry Johnson.

NOTICES TO CORRESPONDENTS.

Home.—Kyan's process for preserving wood consists in immersing it for about a week in a solution containing one pound of corrosive sublimate to five gallons of water. The action of the solution depends upon the sublimate forming an insoluble compound with the vegetable albumen, which is thus rendered unsusceptible of undergoing spontaneous decomposition and of exciting ermentation.

E. W. S.—The carbon cylinders used in Bunsen's battery may, we believe, be purchased without difficulty in London; if not, they may be readily cut out with a saw from the material obtained from gas retorts.

T. Fuller.—Yours came too late for insertion in this number.

David Mushet.—In consequence of our early publication this week, your reply to Mr. Palmer came too late for insertion.

*** All communications intended for publication in the following number must reach us, at the latest, by Wednesday morning's delivery. They should, when convenient, be forwarded earlier in the week.

CONTENTS OF THIS NUMBER.

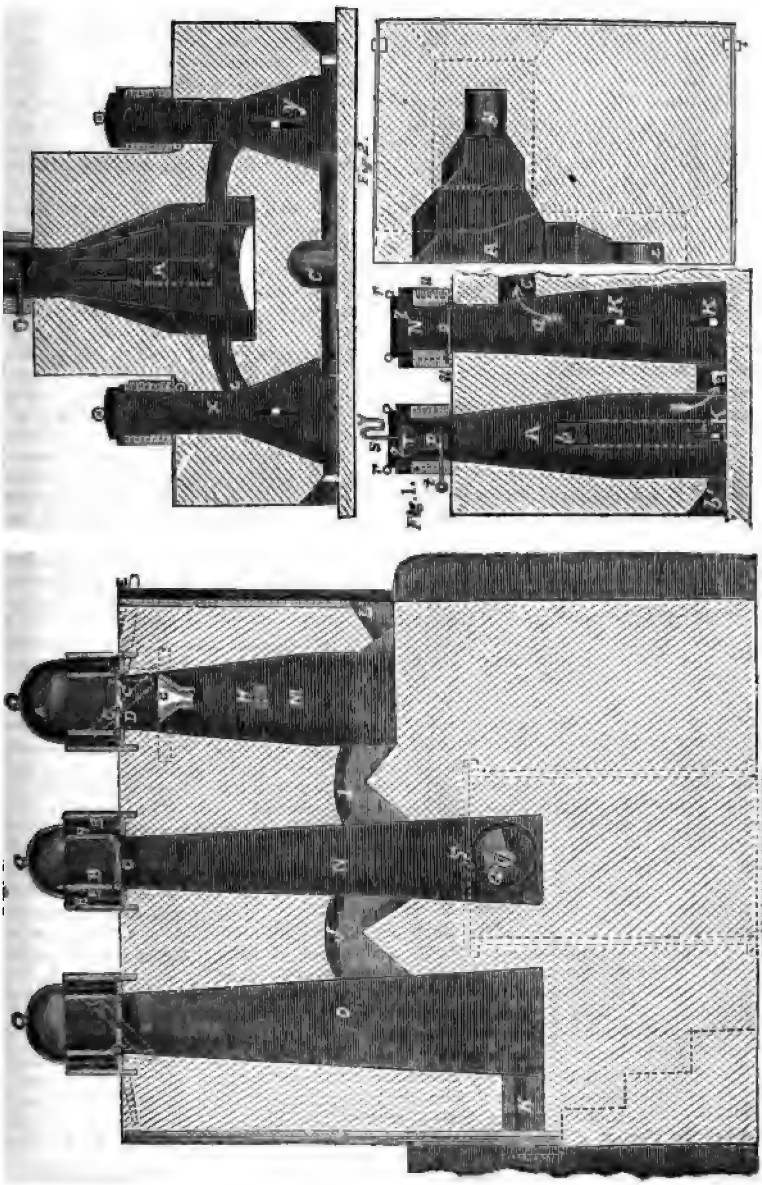
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Mason and Co., *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

. 1653.] SATURDAY, APRIL 14, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

CUVIER'S PATENT FURNACES.



CUVIER'S PATENT FURNACES.

(Patent dated July 11, 1854.)

M. Cuvier, of Seloncourt, France, has patented an apparatus for effecting the combustion of fuel, and the employment of the gaseous products for heating and metallurgic purposes. The following description is derived from his specification.

"My improved apparatus," says the inventor, "which I intend to denominate the Hyper-Gazo-Pyrogène, is intended for the production of combustible gases from wood, charcoal, peat, peat charcoal, coal, coke, anthracite, lignite, boghead coal, or bituminous schist, or other solid fuel: or, from these substances in combination with tar or oily or fatty matters, sawdust impregnated with water or grease, tanner's bark, or other substances capable of yielding combustible gases. The combustible gases produced by my apparatus may be employed for heating steam boilers, gas retorts, and distilling apparatus, and for heating furnaces for melting glass and enamels, baking bricks and pottery, burning lime and gypsum, heating and melting metals, and for heating purposes generally, and also for the reduction of ores or metallic oxides and other metallurgic purposes. The hyper-gazo-pyrogène may be made of various forms, according to the fuel to be employed, as hereafter described.

Fig. 1 of the accompanying engravings is a vertical section of a simple hyper-gazo-pyrogène. A and *a* are two vertical furnaces, placed side by side, and communicating together by an opening at the lower part. On each of the two opposite sides of the furnace, A, is a tuyere or blast-pipe, *b*, for the introduction of a blast of air from a bellows or blowing machine. The two tuyeres are placed at the same level, so that the two blasts strike against each other in the furnace, and may be raised or lowered, as indicated by the dotted lines. B B are openings for removing any slag or scoria which may accumulate at the bottom of the furnaces. K K are other openings for introducing a bar to stir the fires, or break up any lumps or agglomerations in the furnaces. The openings B and K are kept closed when the apparatus is at work. C is a flue or passage which conducts the gases to the place where they are to be used. N is a charging box for introducing a charge of coal or other fuel. It is surrounded with a casing, *u*, containing water or other suitable liquid, forming a hydraulic joint for the bell or cap, *q*, which is provided with loops or ears, *r*, by which it may be raised when required. The weight of the bell, *q*, is partially counterbalanced by a balance weight. *o* is a door or valve which closes the bottom of the box, N. The bell, *q*, being removed, the box, N, is filled with the charge of fuel, and the bell replaced. The valve, *o*, is then opened by means of a lever on the exterior, and the charge of fuel falls into the furnace. A similar apparatus with its bell, *q*, is placed on the furnace, A, excepting that in lieu of the valve, *o*, a hopper, T, with a sliding valve, *p*, is employed. *t* is a rod passing through a tube or stuffing box, for opening and closing the slide, *p*. *s* is a syphon or bent tube, for introducing water, or tar, or other liquid combustible when required. *b'* is an aperture at the bottom of the furnace, A, for emptying it when required. This apparatus is particularly suitable for the production of gas from slightly bituminous substances, but may also be employed for other substances.

"Both the furnaces, A and *a*, are charged with fuel, and air is blown in at the tuyeres, *b*. The air descends through the fuel in A, and ascends again through that in *a*, and the combustible gases thus produced are conveyed away from C to their destination. In employing this apparatus with bituminous coal, the hopper, T, is removed, and the furnace, A, is filled with fragments of coal to within a few inches of the tuyeres, *b*. Some lighted fuel is then placed upon the coal and covered with a few fragments of coal. The hopper, T, is then replaced and covered by the bell, *q*, and the blast of air is introduced at the tuyeres, *b*. When the fire is well alight, the bell, *q*, is again removed, and the hopper is filled with small coal well wetted with water. The bell, *q*, is then replaced, and the slide, *p*, is opened, and the charge of coal falls into the furnace, forming a conical heap, which does not adhere to the sides of the furnace. The second furnace is then gradually filled with successive charges of dry fragments of coal, by means of the charging-box, N, until it is filled to within a few inches of the flue, C, at which height the fuel is maintained by additional charges, in proportion to the quantity consumed. The apparatus being thus set to work, the furnace, A, is constantly charged with wet small coal, and when each charge is about half consumed, a quantity of water is introduced gradually by the syphon, *s*. The slide, *p*, is closed, so that the water has to trickle through between the slide and the bottom edge of the hopper, by which means it is distributed in the furnace. A sight hole is made in the top of the bell, *q*, and each successive portion of water is not added until the previous one has evaporated; and the light of the furnace can be seen at the bottom edge of the hopper. The furnace, *a*, is constantly charged with dry fragments of coal. When the fuel employed is wood, or lignite, or peat, the hopper, T, may be removed and replaced by valves, as in fig. 4. In this case,

as in that before described, it is advantageous to employ the combustible as wet as possible in the furnace, A, and in fragments as dry as possible in the furnace, *a*. When tar is to be employed, the apparatus is charged as before described, and the tube, *s*, is connected with a vessel containing the tar, the flow of which is regulated by a valve or cock. It is advantageous to employ a vessel furnished with an agitator, by means of which the tar is intimately mixed with water; a larger quantity of gas of greater heating power is thus obtained.

"Figs. 2 and 3 represent a hyper-gazo-pyrogène, in which the gases descend from the principal furnace into others placed below it. Fig. 2 is a horizontal section of one half of the apparatus; and fig. 3 is a vertical section of it. This apparatus is employed with advantage for obtaining a large quantity of gas, and especially for the treatment of very bituminous or very heavy combustibles, because the multiplicity of furnaces facilitates the decomposition of the vapours, and permits of operating upon large masses of fuel in comparatively thin layers, and avoids the danger of obstructions occasioned by the compression due to the column of fuel in the furnace; and the action of the apparatus is similar, excepting that the air and gases from the first or primary furnace, A, descend through the secondary furnaces, *x*, *y*, *z*, and pass through the flues, C′, to the central or main flue, C. This apparatus may be made with one, two, or more secondary furnaces, at pleasure, and may be employed for every description of fuel.

"Fig. 4 is a vertical section of a hyper-gazo-pyrogène with three furnaces, communicating together, and intended for obtaining combustible gases from combustibles and carbonates decomposable by heat, or from bituminous schist, or metallic oxides employed simultaneously. M is the first or principal furnace, similar to that marked A in the preceding figures. It is surmounted by a charging-box with two doors or valves, C, connected together by the levers, F, and rod, D, and worked by a lever, E, as shown by the dotted lines. By raising the lever, E, the valves are both opened, and the charge in the box is dropped into the furnace. The charging-box is covered by a bell, A, dipping into the water in the casing, B. G is a hopper, supported by iron bars, and serving to guide the charge to the centre of the furnace. H H are the tuyeres; L is an opening for emptying the furnace; I is a passage communicating with the second furnace, N, which is surmounted by a charging-box with a single valve, C, worked by a lever; J is a passage connecting the furnace, N, with the third furnace, O, which is provided with a similar charging-box to that of the first furnace; K is the flue for the exit of the combustible gases. To put this apparatus in operation, the furnace, M, is charged in the manner already described with regard to the furnaces, A, and air is blown in at the tuyeres until the furnaces, N and O, have become heated. The furnace, N, is then charged with boghead coal, or bituminous schist, or a metallic oxide which is not easily fusible (as, for example, the peroxide of manganese, which may be again oxidized by exposing it to a moist atmosphere); or with a mixture of schist and metallic oxide, or with limestone or other carbonate of lime. The furnace, O, is then charged up to the level of the passage, J, in a similar manner to that before described in reference to the furnaces, *a*. When metallic oxides are employed, their oxygen is disengaged and combines with a certain quantity of the combustible in the furnace, O, forming carbonic oxide. When carbonates are employed, the carbonic acid which is disengaged from them gives up a portion of its oxygen to the combustible in the third furnace, O, forming carbonic oxide, and being itself reduced to the state of carbonic oxide. In these cases, the quantity of air supplied by the tuyeres may be much diminished, and the quantity of nitrogen or azote being thus reduced, the heating power of the gases obtained will be considerably increased. When bituminous schist is employed, as before described, its volatile matter distils off, and the decomposition of the vapour is commenced by the high temperature to which it is exposed, and is completed by its passage through the ignited fuel in the furnace, O. For the purpose of obtaining a continuous decomposition, by successive charges of oxides, or carbonates, or schist, there is placed at the bottom of the furnace, N, an iron screw, Q, upon a shaft, *q*, which passes through the masonry, and is supported on one side by a fixed bearing, adapted to the outer part of a close box, S. The extremity of the shaft has two transverse holes, at right angles to each other, for receiving a lever or levers, by which it may be turned round. By turning this screw, the exhausted materials are drawn out of the furnace, N, into the discharging-box, S, from which they are removed from time to time through an opening closed by a lid secured by a cross-bar and screw."

MR. FAIRBAIRN ON THE STEAM ENGINE.

Mr. W. Fairbairn, C.E., F.R.S., has delivered, at the Mechanics' Institution, Manchester, two lectures—one on "Steam: its Properties and Application to the Useful and Industrial Arts;" and a second on "The Strength and Form of Vessels calculated to insure safety, and resist the Elastic Force of Steam; the Relative Proportion of Flue to Furnace Surface in Boilers; and the Relative Values of High and Low Steam." These lectures are well worthy of the fame of Mr. Fairbairn; the first presenting an admirable digest of all that has yet been effected towards the perfecting of our knowledge of the generation and application of steam, and the second containing suggestions that bear very importantly upon the future development of the steam engine. The following forms part of the second lecture:

The advantages of high steam, worked expansively, were early discussed; and both high and low steam were used in the mining districts: but it was only within the last ten or twelve years that manufacturers in this country had appreciated high steam, owing to the increase of manufactures and the unequal increase in the price of coal. It was used earlier on the Continent and in America. In combating the objections against it many years ago, he demonstrated its saving of fuel and increase of power. With it the double-cylinder engine was preferable for regularity of motion, but it did not save more fuel. The irregularity of the single engine was of less importance than many imagined, and was easily remedied by increasing the weight of the fly-wheel, and neutralising the irregularities of the stroke of the piston by velocity. Two engines might be worked together at right angles without these irregularities, and with perfect safety, through the whole range of expansive action. Therefore, he recommended the single engine. It was less expensive, equally efficacious, and, perhaps, more economical than a machine of greater complexity. Considering the facts already stated, we must look forward to the use of a greatly increased, instead of a reduced, pressure of steam. So convinced was he of the advantages of high steam worked expansively, that he urged preparation for greatly increased progress. It must be obvious that steam generated under pressure, compressed into one-fifth or one-sixth the space it formerly occupied, and again, applied to an engine of little more than one-tenth the bulk, must be a desideratum in the appliance of steam. The force applied to one of the largest of locomotive engines, travelling with a train at the rate of 45 miles an hour, exceeded 700 horse power; and there was no reason why factories should not be driven, and the largest ships propelled, by such engines, with greatly increased economy, by well-directed condensation. Soon this would be more extensively accomplished than might now be considered possible or safe, and space would be lessened and power doubled with greatly increased economy and effect. He and another gentleman had been in communication with the Admiralty respecting the introduction of high-pressure steam upon the same principle as used on the railways; and he was satisfied that, if properly applied, it would effect an important saving in steam navigation. The cylindrical or spherical was the most eligible, and the strongest form in which iron plates would resist internal pressure. The deduction for loss of strength on account of riveted joints, and the position of the plates, was about 30 per cent. for the double-riveted joints, and 44 per cent. for the single ones; the strengths (calling the plates 100) being in the ratio of 100, 70, and 56. He found that 34,000 lbs. to the square inch was the ultimate strength of boilers having their joints crossed and soundly riveted. Flat surfaces, frequently essential, were not so objectionable with respect to strength as they appeared to be at first sight; but, when properly stayed, were the strongest part of the construction. This was proved by the result of experiments made on the occasion of the bursting of a boiler at Longsight. * * * The first series of experiments proved the superior strength of the flat surfaces of a locomotive fire-box, as compared with the top or even the cylindrical part of the boiler. The latter evidenced an enormous resisting power, much greater than could be attained in any other part of the boiler, however good the construction; and they showed that the weakest part of the box was not in the copper, but in the iron plates, which gave way by stripping or tearing asunder the threads or screws in part of the iron plate. According to the mathematical theory, the strength of the second plate would have been 1,273 lbs.; but it sustained 1,625 lbs., showing an excess of one-fourth above that indicated by the law, and that strength decreased in a higher ratio than the increase of space between the stays. The experiments show a close analogy as respects the strengths of the stays when screwed into the plates, whether of copper

or iron; and riveting added nearly 14 per cent. to the strength which the simple screw afforded. These experiments were conducted at a temperature not exceeding 50° Fahrenheit. His experiments on the effects of temperature on cast iron did not indicate much loss of strength up to a temperature of 600°; and he concluded that the resisting stays and plates of locomotive boilers were not seriously affected by the increased temperature to which they were subjected in a regular course of working. The subject was entitled to further consideration. In boilers it was necessary to preserve a large margin strength as regarded. the working pressure and the ultimate power of resistance. Six or seven times the working power was not too much to provide for contingencies. With respect to the proportion or relative values of the furnace to the other absorbent surfaces, as recipients of heat, there was great diversity of opinion, as much depended upon the quality of the fuel used, and the rate at which it was consumed. There was no fixed rule as to the proportion of the dimension of the grate-bars to that of the surface of the boiler exposed to the action of heat; and a series of well-conducted experiments on these points was much wanted, to determine also the quantity of heat absorbed by the surfaces surrounding the furnace, and at different distances, as these surfaces receded from the immediate source of heat. Fourteen or fifteen years ago, he found the mean of 15 boilers to be nearly as 1 for the grate-bar surface, to 11 recipient or heating surface. This was approximately correct, and appeared to be in use for obtaining the best results; but he had doubts as to its accuracy, as it was formed upon no fixed law. Time was an element which could not be neglected in the combustion of a certain quantity of fuel, and hence we had slow, active, and "excited" combustion. The first was practised generally in Cornwall, where the draught was kept down by the damper, and the heated currents made two or three circuits of the boiler at a slow rate, thus affording time for the absorption of heat during its passage to the chimney. Stationary boilers received every description of treatment, in all its gradations from slow to active combustion, arising from the want of space, or the want of money, or of the inclination to spend it in the construction of new boilers; and combustion was sometimes carried on with such determined energy as to cause an enormous waste of fuel, expensive as regarded wear, and productive of smoke. The marine boiler admitted of no alternative, and the combustion must be active owing to the small space allotted to the boiler; but much might be done to economise fuel, by increasing the areas of the recipient surfaces, which was best accomplished by the tubular system, and a wide diffusion of the increments of heat as they passed from the furnace through the tubes, and thence to the water in the boiler. Excited combustion applied almost exclusively to locomotive engines. The boiler was similar to the multitubular; but whilst, in one, the fire was supplied with oxygen by the rarefied draught of the chimney, in the other it was excited with much greater intensity by the blast of the steam passing from the cylinders at great velocity into the chimney. The steam operated upon the smoke-box behind, and through the tubes to the furnace, like a pump, and rapid currents of cold air blew up the furnace when the engine was in motion; therefore, "the faster she goes, the harder she blows" — (laughter) —and at high speed such an engine had all the properties of the blow-pipe, in exciting and maintaining an intensity of heat in the furnace almost sufficient to melt the hardest metals, producing a white heat, which would soon destroy the fire-box, but for the great difference between its temperature and the water in the boiler, which seldom if ever exceeded 400°, that of the furnace being probably as high as from 1,500° to 2,000°. Owing to this intense heat, the furnace had to be surrounded with material, such as copper, of high conducting powers, and other recipient surfaces, such as the tube. These required to be as thin as possible, to save time in the transmission of heat, and to effect a rapid evaporation from the water contained in the boiler. The difference, therefore, between locomotive and other boilers was, that time was of more importance, as the locomotive would raise as much steam in one hour as a stationary or marine engine boiler would raise in twenty; the former requiring 15 square feet of fire-bars, and the latter 300 square feet, being in the proportion of 1 to 20. The subject deserved careful investigation, and we might reasonably hope to gain advantage from a principle only partially developed as yet. Safety-valves had occupied much attention; but the projects put forward, though exceedingly ingenious, were not self-acting and free from risk. There were nearly twenty different ways of feeding a boiler. In Watt's days, a pump supplied a cistern 10 or 12 feet above the boiler, which height measured the pressure of steam within. Now, the altitude of a column of water must be measured by the height of the chimney, which was too expensive and inconvenient for high-pressure steam. The only alternative was a pump powerful enough to overcome the resistance of the steam, and to regulate the supply in such a way by the

admission-valves, as would cover the flues and maintain the water at a fixed and uniform height. This was accomplished in several ways, with appendages which, though not necessary, did no harm if kept clean and in working order. Working steam expansively was one of the most important subjects to which the engineer could direct his attention. The difference between high and low steam was the measure of elasticity and temperature, when taken at the extremes at which it is worked, from 10 lbs. to 150 lbs. on the square inch. When the steam impinges upon the piston at 10 lbs., it follows up the supply and pressure continually throughout the whole length of the stroke, or nearly so; but steam of greater density, instead of pressing upon the piston with a continuous flow, had its communication with the boiler intercepted at a particular point of the stroke, and the steam thus cut off was left to perform the remaining portion of the stroke by its own initial or elastic force, dilating or expanding as the piston moved. This was the theory of what was technically called working steam expansively. There were no calculations founded upon experimental facts respecting the value of the system. He, however, demonstrated that, with an engine of six feet stroke, cylinder 40 inches diameter, and cutting off the steam (40 lbs. on the square inch) at one-sixth of the stroke, it did rather more than one-half the duty with one-sixth the quantity of steam that would otherwise be used, or above three times the work. It was important to attend to the perfect combustion of fuel, and the transmission as well as the retention of heat, as it was evolved in the process, and also to maintain cleanliness and order about a steam engine and a boiler. In a well-managed concern, safety-valves and feed-pumps were not allowed to continue out of repair, and there was no tampering with such vital organs of safety. Everything was in its place, and was kept in the most perfect order, well oiled and well cleaned, so as to be at all times ready for service. With respect to the steam engine also, the same regularity and system of management was preserved; and the result was a beautiful piece of machinery, working with a degree of precision at once the admiration of the employer and the pride of the engineer. He would have all the engines kept in this style. Hence the advantage of polished surfaces and the mathematical exactitude with which the steam engines of the present day were executed. A well-constructed machine, neatly executed, had a wonderful effect upon the mind of its keeper. It only required a few months to accustom him to habits of cleanliness and order; and it improved his taste and elevated his mind to see his pet engine, with the arms of a giant, finely polished, overcoming the resistance of a thousand horses, and impelling with the same apparent ease a floating citadel or a ponderous train. In conclusion, he would quote the words of a distinguished writer, who, in speaking of the steam engine, said:

"It is stupendous alike for its force and flexibility—for the prodigious power which it can exercise, and the ease, and precision, and ductility with which it can be varied, distributed, and applied. The trunk of the elephant, that can pick up a pin or rend an oak, is nothing to it. It can engrave a seal, or crush masses of obdurate metal like wax before it; draw out, without breaking, a thread as fine as gossamer; and lift a ship of war like a bauble in the air. It can embroider, forge anchors, cut steel into ribbons, and impel loaded vessels against the fury of the waves."

It could do all this, and more, since the eulogium quoted was pronounced; and he looked forward to the time when still greater impossibilities would be effected in the action of the steam engine and the use of steam.

PENN'S PATENT BEARINGS AND BUSHES FOR PROPELLER SHAFTS.

On the 2nd of last October Mr. J. Penn, the eminent engineer of Greenwich, patented the employment of wood in the construction of bearings and bushes for the

Fig. 1. Fig. 2. Fig. 3.

shafts of screw-propellers, and has already applied the improvement to numerous

vessels, including several of Her Majesty's ships.

The accompanying engravings represent three of the methods of fitting the wood which have been adopted by Mr. Penn. In fig. 1 A is the shaft, surrounded by a brass casing, B; D is the bearings of the shaft, the inner surfaces of these being grooved to receive fillets of wood, C, which project beyond the inner surfaces of the bearings, so as to prevent the shaft from coming in contact with the metal of the bearings, the spaces thus formed allowing water to flow freely between the shaft and the bearings. In fig. 2 the wooden fillets are fixed in the casing on the shaft, and turn within the bearings, instead of remaining fixed, as in the former case. In fig. 3 the wooden fillets are fixed within the bearings, and have their edges bevelled; so that where each neighbouring pair of fillets come together, they have a groove between them for the passage of water. The interior of the bearings is lined with these fillets, as shown, and the whole are wedged tightly together by a metal fillet fixed in the bearing by screws or otherwise.

For the proper application of the invention it is necessary that the shaft and bearings be covered or bushed with brass, and that a free flow of water be admitted to the rubbing surfaces. The wood preferred for this arrangement is lignum vitæ, which, as is well known, has long been in use in machinery where much friction has to be borne, and hardness and strength are necessary.

ON THE APPLICATION OF CHARCOAL TO SANITARY PURPOSES.

BY DR. JOHN STENHOUSE, F.R.S.*

After describing the various ways in which both animal and vegetable charcoal are manufactured, the lecturer stated that the different kinds of charcoal most commonly in use may be conveniently divided in three species, viz., wood, peat, and animal charcoal. The results of Saussure's experiments on the absorption of gases by boxwood charcoal were then exhibited in a tabular form. The lecturer then described a series of experiments made by him, to ascertain the comparative absorbent power of wood, peat, and animal charcoal for gaseous bodies. From these it appeared that wood charcoal possesses a slightly higher absorbent power for ammoniacal, sulphuretted hydrogen, sulphurous acid, and carbonic acid gases than peat charcoal; the absorbent powers of which, however, are immensely greater than those of animal charcoal. As a decolorizer, however, animal charcoal is greatly superior to either wood or peat charcoal.

A description was next given of Mr. Turnbull's and the lecturer's experiments, which consisted in burying the bodies of dogs and cats in charcoal powder, and in covering them over with about a couple of inches of the same material. No effluvia were ever perceptible, while the decomposition of the bodies was greatly accelerated. This arises from the circumstance that charcoal absorbs and oxidises the effluvia, which would under ordinary circumstances be evolved directly into the air; but within the pores of the charcoal they are brought into contact with condensed oxygen, and are thus subjected to a species of low combustion, their carbon being converted into carbonic acid, and their hydrogen into water. Charcoal, therefore, so far from being an antiseptic, as was till recently universally believed, is, in fact, precisely the reverse.

The lecturer then stated, that from reflecting on the wonderful power of charcoal in absorbing effluvia and miasmata, as exhibited in the cases just described, where, as we have seen, all the putrid exhalations from the bodies of pretty large animals were absorbed and destroyed by a layer of charcoal powder little more than an inch in thickness, it struck him that a very thin layer of powdered charcoal would be equally effectual in absorbing the very minute quantity of infectious matter floating in the atmosphere of what are called unhealthy situations. This led him to the construction of the so-called charcoal air-filter, first exhibited and described by him before the Society of Arts, on the 22nd of February, 1854.*

The charcoal air-filter may be advantageously applied to buildings, to ships, to the gully-holes of sewers, to respirators, and to many similar contrivances. The charcoal air-filter consists of a thin layer of charcoal powder, enclosed between two sheets of wire gauze. One of these air-filters, or charcoal ventilators, was erected more than three months ago, in the justice-room, at the Mansion-house. This apartment, from the position of a large urinal and other nuisances, in the very narrow street from which it is ventilated, was usually so offensive as to have become the subject of general complaint. Since the erection of the charcoal ventilator, through which all the air entering the apartment is made to pass, all the impurities are absorbed, and the atmosphere of the room has become unexceptionable. From the success attending on the charcoal ventilator at the Mansion-house, the city authorities have

* Abstract of a lecture recently delivered at the Royal Institution.

* *Mech. Mag.*, vol. lx., p. 202.

fitted up the justice-room at Guildhall with a similar apparatus, which is giving equal satisfaction. The charcoal ventilator at the Mansion-house has never required any alteration, such as renewal of the charcoal, or otherwise. Charcoal ventilators cannot fail to prove eminently useful in all situations where foul air is apt to accumulate, such as in water-closets, in the close wards of hospitals, and in the back courts and mews-lanes of large cities, all the impurities being absorbed and retained by the charcoal, while a current of pure air alone is admitted into the neighbouring apartments. In this way pure air is obtained from exceedingly impure sources.

A short sketch was then given of the history and construction of respirators, from their first proposal by Dr. Beddoes, of Bristol, in 1802, till their description, some seventeen or eighteen years ago, by Dr. Arnott, in a lecture at the Royal Institution, and their being subsequently patented by Mr. Jeffreys, who first brought them into general use. Mr. Jeffreys' and the ordinary respirators are intended merely to warm the air; but the charcoal respirators, especially those which embrace both the nostrils and mouth, purify the air by filtration, and thereby deprive it of the noxious miasmata which, in unhealthy situations, it not unfrequently contains. Experience has shown, however, that charcoal respirators not only purify the air, but warm it sufficiently, while they possess several advantages over the ordinary respirators. Thus, for instance, they are lighter and more easy of construction; and where the breath is at all fœtid, as is usually the case in diseases of the chest, throat, &c., the disagreeable effluvia are absorbed by the charcoal, so that pure air alone is inspired. The charcoal respirators are also exceedingly easy to breathe through, as, owing to the non-conducting nature of their material, they do not condense the moisture of the breath to an inconvenient extent. There are three forms of the charcoal respirator, one for the mouth alone, the others embracing both the mouth and nostrils; these two latter forms being specially intended to guard the wearer against fevers, and other infectious diseases. Powdered charcoal has, during the last twelve months, been most successfully employed both at St. Mary's and St. Bartholomew's Hospitals, and in other similar establishments, to arrest the progress of gangrene and other putrid sores. In the case of hospital gangrene we have to deal not only with *effluvia*, but with real *miasmata;* for gangrenous sores not only affect the individual with whom the mischief has originated, but readily infect the healthy wounds of any person in its vicinity. In this way gangrene has been known to spread not only through one ward, but through all the wards of even a large hospital. This, and other instances which might easily be adduced, prove that charcoal is not only a deodorizer, but a very efficient disinfectant. A great variety of other instances were mentioned, in which charcoal respirators would certainly prove exceedingly useful; such, for instance, as to house-painters, the gunners in casemated batteries, persons requiring to traverse unhealthy districts within the tropics, such as the Delta of the Niger, the foot of the Himalaya, &c.

The lecturer concluded by stating it as his confident belief, that if our soldiers and sailors, when placed in unhealthy situations, were furnished with charcoal respirators, and if the floors of their tents, and the lower decks of ships were covered by a thin layer of freshly-burned wood charcoal, we would have little in future to apprehend from the ravages of cholera, yellow fever, and similar diseases, by which our forces have of late been so cruelly decimated.

ON THE APPLICATION OF SCREW PROPELLERS TO LARGE SAILING SHIPS.

The discussion on Mr. R. A. Robinson's paper on the above subject, was renewed at the Institution of Civil Engineers on the evening of Tuesday, April 3, and continued through the evening.

It was argued that a vessel carrying 3,000 tons, besides machinery and coals, would require 1,000 horse power (indicated) to obtain 8½ knots per hour, and even by that means could not save more than 7½ days in a voyage like that of the *Red Jacket*. Arguing from these premises, and demonstrating the position by a diagram, showing the courses of various ships, it was contended that the commercial advantages of employing auxiliary steam power on voyages to Australia were questionable, inasmuch as the small saving of time on the voyage could not command such an increase in the rate of freight as had been named.

The prevailing westerly winds and currents in the Southern Ocean might always be depended on if a proper course was taken, as laid down in Lieutenant Maury's charts; and it was not improbable that, from a continuance of the same admirable observations as had served for the foundation of these charts, and the classification of the valuable documents said to exist in the archives of the Admiralty, such further information would be obtained as would eventually still shorten and render more certain the voyages of the sailing clippers.

It was admitted that small auxiliary power would be very desirable for enabling clipper ships to work into and out of port, and to make some way in what were called the "horse latitudes;" but the expectation of great advantage being derived on the Australian voyage was contended to be fallacious. These remarks were not meant to apply to auxiliary screw clippers intended for other routes, but rather to enforce the position of its being always necessary to consider carefully the peculiarities of the intended station, and to adapt the power and means of propulsion to them. The question of the speeds of American vessels was again raised, and it was contended that the transcripts of the logs alluded to were correct, and did fairly represent the speeds attained.

It was shown that the *Great Britain*, having 14,000 yards of canvas in a suit of sails, exceeded in extent of sails any of the clipper ships, and that although it had been predicted for her that she would be a very fast steamer, yet it was not supposed that she would attain the great speed under canvas which she had actually exhibited,—it having been stated that she had run 17 knots per hour whilst dragging her screw through the water.

It appeared to be shown that neither the full-powered steamers nor the large auxiliary power sailing ships hitherto placed on the Australian route, had been commercially successful, and therefore a class of minimum power auxiliary screw-propelled ships, fully rigged, was advocated, with the view of sailing at all times, should the wind serve, and only to employ their steam power in calms and under favourable circumstances. When the sun was far north, the trade wind ceased and calms commenced, in 15½° to 16° north latitude, and continued as far as 3° to 4° north, or over a space of nearly 700 miles, in the usual track of ships from the North to the South Atlantic. In the contrary season, with the sun far south, the trade wind usually failed in about 6° north latitude, and thence to the equator, or 2° south, constant calms prevailed over 400 to 500 miles; the ships only getting over that space by occasional squalls of short duration.

Now it was in these positions that the minimum power was required, and by its judicious use it was very possible to save 10 days on the Australian voyage, and make a corresponding profit.

As to the comparison of the lifting the screw of the *Dauntless* in a frame by 30 men in 9 minutes, as compared with turning up that of the *Caroline*, upon a rule joint in the dead wood, with 3 men in 3 minutes, there could not be any question as to which was the best system for a trading vessel; and it was contended that the screw should remain always coupled to the driving shaft, to avoid the rattling and noise arising from having easy allowance for coupling.

As to American vessels coming to Great Britain, it was contended that it was beneficial for both shipbuilders and merchants that the American vessels should beat those of this country, as otherwise the desire of having immense cargoes carried in vessels of nominal small tonnage, would do away with all scientific improvements in construction.

The Americans had, moreover, shown that something of cargo must be sacrificed to speed, and this country was much indebted to them for the lesson; as also for demonstrating the necessity for having the best practical seaman for the captain, and making it his interest to get as much out of the craft as her power and speed would give.

The general assumption was, that having engines of 200 horse power (nominal), and with the expenditure of 350 tons of coals, a sailing clipper ship, with an auxiliary screw propeller, might save ten days on an average passage to China or to Australia, supposing the steam only to be used in calms, and under circumstances to enable a maximum effect to be produced by a minimum expenditure of fuel; it being taken as proved that a minimum-powered clipper ship could not possibly be commercially successful, if overloaded with coals or consuming such a quantity of fuel as had been required by the auxiliary power ships hitherto in use.

Full credit was given to the charts of Lieut. Maury for pointing out the steady wind course; but it was contended that even on that track, at certain periods, there were winds so light that the best ships could not make more than two knots an hour.

It was maintained that the author of the Paper had not received any intimation of the construction of the *Royal Charter*, and that the fact of the adoption by so eminent a firm as Messrs. Gibbs, Bright, and Co., of the dimensions of the ship and the power of the engines so exactly similar to those advocated by the author, was the best proof of the soundness of his views.

It was contended that this commercial question was of great importance; but it would have been desirable that it should have been preceded by a Paper on the forms and capabilities of screw propellers. It was, however, suggested that such a communication should still be made, when the whole question would be re-opened, and the experience of the relative merits of the various systems of lifting the screws, and the results of dragging them through the water, could be fairly laid before the meeting.

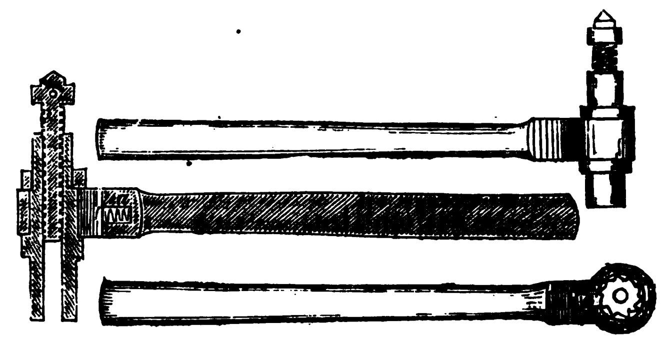
Doubts were expressed as to the anticipated advantages of having a very small engine merely to give a slow speed to the screw

when the vessel was under sail, and calculations were given to demonstrate its inutility, based on the results obtained by Messrs. Maudslay and Field, in their experiments on the feathering screw.

The benefits arising from the friendly rivalry between America and Great Britain in ship-building, in engineering, and in general manufacturing and production, were frankly admitted, and fervent hopes were expressed for that being the only kind of rivalry the two countries would ever be engaged in; it was the only contest in which the least successful was the greatest gainer.

FENN'S PATENT RATCHET BRACE.

Mr. Fenn, the well-known tool-maker, of Newgate-street, London, is very extensively manufacturing a recently patented ratchet-brace, which, from its great strength and simplicity of construction, is in great request, particularly among boiler-maker. The accompanying engraving represents the improved brace. The catch-wheel, it will be seen, is fitted inside the bow of the lever, and a slot is cut in the lever to admit



a sliding catch, which is driven into contact with the wheel by means of a spring, *a*, placed at the back of it.

The advantages possessed by this instrument are that, as the strain on the lever is increased, the catch takes a firmer hold of the catch-wheel, and the brace is therefore well adapted for heavy work—that from the simplicity of its construction, it is manufactured at a small cost, and therefore supplied at a low price—and that there is but little liability of its getting out of order.

CALLAN'S NEW MAYNOOTH SINGLE-FLUID BATTERY*

To the Editor of the Mechanics' Magazine.

Sir,—What has become of your Argus-eyed correspondent, Mr. Baddeley, that he does not enlighten us as to what is and what is not *new* in this "New Maynooth Single-Fluid Battery" beyond the name?

Like many others of your readers, from the flourish of trumpets which preceded its publication, remembering whence it proceeded, I was in great expectation that we were about to have something "great and good" in batteries—something that was to do away with all slop, stench, and other disagreeable accompaniments, besides producing a practical effectiveness much beyond what we have been accustomed to; and all this after a new fashion, and upon new principles. But it appears we are not.

The first of the claims in this patent endeavours to make good, to the new-born, a variety of proportions of various liquids as exciting fluids, on which, as on many others beside, the changes have for long been rung by all who have constructed batteries upon even the simplest theories of galvanism, and which are now, as they have long been, patent to all, and may be used in any proportions that may be considered suitable.

The other three claims appear to amount pretty much to the same thing, and are somewhat misplaced under the title "single-fluid battery;" and (although the trumpets may not have been intended to sound for them) only tend to mislead one, as there are no special advantages stated to be gained. Practice will prove, however, that the original Daniell's battery is preferable to the copy in cast iron, in which I see nothing new beyond the fact of its being patented.

* See *Mech. Mag.* for March 17, p. 249, and March 24, p. 282.

In the April number of the *Philosophical Magazine* there is a long communication from Dr. Callan, explanatory of the aforesaid. I will pass over all that is there stated respecting the *proportions* of the exciting fluids and their varieties—as to which most people will suit themselves, as heretofore—and just notice the effects there stated to be acquired, together with the comparisons made, and the advantages said to be gained. He states: "In making a cast-iron battery to be excited by any of the fluids which I have described, care must be taken first to have the cast iron and the zinc very near to each other; and, secondly, to protect the inactive part of the cast iron against the action of the exciting fluid, and when the battery is intended not for constant work, but for experiments which may be occasionally interrupted, to make provision for taking the metallic plates out of the exciting fluid whenever it may be necessary to suspend the experiments."

Now the great stress laid on the necessity of ensuring proximity of the plates, which seems to be nearly the sum total of the whole matter, is mere child's play, suggesting nothing novel, but simply applying part of the common theory of a battery. At the same time it proves that the comparisons made by the Professor subsist upon a false basis, since in the case of the double fluid that proximity cannot be obtained, and therefore from an equal surface there is not the same *quantity* produced in the double as in the single fluid, although the *intensity* of the former may be double that of the latter. The distances of the plates is merely one of the elements of the resistances, and although greater quantity is obtained as their proximity increases, there is nothing gained by this, as the deterioration of the exciting fluids is thereby promoted, and the constancy of the battery is diminished accordingly. Enlarging the surfaces answers the same purpose, costs no more by the destruction of acids and metals, and gives longer duration of action. The comparisons above mentioned are therefore nothing more than the trial of a large surface in the single-fluid against a small one in the double.

The above considerations also show that the results of certain experiments through the galvanometer, detailed by Mr. Callan, are likewise fallacious. He states that the circuit through which he sent the current was seven feet long, and the conductor three-eighths of an inch in diameter, and that the double fluid deflected the needle 82° towards one side, whereas when the current from the single fluid was passed in the opposite direction, it not only overcame the current from the double, but deflected the needle 72° on the opposite side. The fact is, the effect could not be expected to be otherwise, seeing the conditions of the galvanometer coil relatively to the conditions of each of the two batteries which differ so widely in their primary and elementary qualities. To make the trial fairly between the double and single fluid-batteries we should have equal surfaces, equal resistances, and therefore equal distances, and also a porous cell placed in the single fluid (also for the purpose of equalizing the resistances), and then see which is best. Otherwise the one has an effective element introduced which the other has not, and *vice versâ*, viz., quantity or intensity in excess above the other.

The protection necessary for the inactive part of the cast-iron, pointed out by Mr. Callan, shows there must be great local action, and consequently considerable changes in the properties of the fluids going on, which is the necessary evil attending all iron batteries, rendering their action of so short a duration as to render them unfit for but little more than a striking experiment in the lecture room. Moreover, the use of iron is always attended, after a while, with very bad odours, constant local action going on if the plates are immersed when the battery is not in action; it, therefore, requires perpetual attention and frequent changing, as may indeed be inferred from what Dr. Callan himself says of the experiments made. If this is true, his arrangement is still, notwithstanding all its alleged advantages, a long way from what is required as a useful, simple, easily managed, constant, but yet powerful battery. One that would last comfortably a week would be something like what we need.

I am, Sir, yours, &c.,

A GALVANIST.

P. S.—With reference to the galvanometer experiments I may add, that with a ⅜ in. conductor, quantity will of course beat intensity, but try it with a No. 16 or 18 wire and the effects will probably be found reversed.

ELONGATED SHOT OR SHELL AND EXPANDING SELF-CLEANSING SABOT.

To the Editor of the Mechanics' Magazine.

SIR,—My improved shot, to which I now desire to call attention, differs from the expanding-shot that I invented in the year 1823, and is superior to it, inasmuch as by using the expanding-sabot there is no *friction* or *leading* by the passage of the shot through the barrel; it assimilates more closely to the Malay arrow, which expands at its hollow base, formed of the pith of the lotus plant, which arrow first attracted

my attention, and directed it to remedy the evil of the loss of power in shot from *windage*, as far back as the year 1818, when serving in the East Indies. I bottled up the milk of this idea till I should return with my regiment to England, and when I did return in the summer of 1823, I, with the sanction of the then Commander-in-Chief, and Master-General of the Ordnance, *spilled* the cream of it before the select committee of Artillery officers at Woolwich, in the autumn of the same year. The expanding sabot may be fortified by a disc of leather or card glued on its base, or it may be formed altogether of leather. The circular cavity in the centre of the sabot (fig. 3) is cut by a sharp tube, like the upper part of a steel pen, and by pressing it home on the square shank it takes the square form. Cork can be compressed into the form by heating it in boiling water, then forcing it into moulds and allowing it to cool, after the plan of Mr. Robert Jennings, of Cork. It is of no consequence if it separates from the shot on leaving the mouth of the rifle, as the rotatory motion is already fully communicated to the long axis of the shot, fig. 2. All difficulty with rifle-cannon is now overcome by the application of the expanding-sabot to the shot or shell, fig. 1. The cartridge may be attached to the sabot, as represented by fig. 1, and the fire communicated horizontally from the centre of the breach, as shown by fig. 23, page 7, in my pamphlet on Projectiles. The unburnt portion of the cartridge is carried out by the shot or sabot to which it is attached, and no residuum is left behind in the barrel.

Fig. 1.

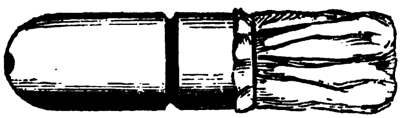


Fig. 2.

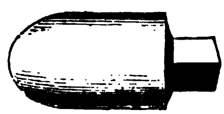
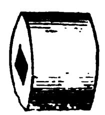


Fig. 3.



In the *Liverpool Courier* of the 14th of February, under the head of "What is a Lancaster gun?" there is the following sentence: "As a rule, cannons must be supplied with iron balls, and iron balls are altogether unmanageable in connection with the principle of ordinary rifles." I have used iron balls having expanding sabots attached to them from ordinary rifles, and also will engage to adapt them to rifle-cannon, not excepting the elliptic particular bore oval gun, or two-groove rifle-cannon, by using sabots made of prepared sawdust compressed by hydraulic power. If the sabot, fig. 3, is made about double the length of that represented, it will cause the shot or shell to carry "point foremost," when discharged from a barrel *not* rifled, and is then efficient for *vertical fire* to dislodge the enemy from behind barricades, even when discharged from an ordinary dragoon's pistol.

I am, Sir, yours, &c.,
JOHN NORTON.

ON THE INDICATED HORSE-POWER OF STEAM-ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—I beg to be allowed to say a few words in reply to the recent communication of "Ingénieur," on the indicated power of steam-engines.

I fear that "Ingénieur's" claim to his title is as unfounded as the treatment his opponents receive at his hands is uncourteous. He appears to be quite convinced that he has made an important discovery, and is but little disposed to tolerate the opinion of those who think as I do, that he has discovered nothing but a mare's nest. If he will refer to your Number of the 10th of last month, he will see that it is there stated that the question under discussion, as I understand it, is this: given an indicator diagram to find the work done by the *piston of the* engine, from which it was taken, in *one stroke;* and as the quantity of work done by a force is equal to its intensity multiplied by the space it moves through, in the direction of its action, he will, I hope admit, as everybody except himself has hitherto done, that the question is entirely independent of time, and that what I really said in my former letter, instead of being palpably absurd, is a hard truth; and that when he tells us that the number of strokes per minute has no earthly bearing on the subject, he unwittingly makes a perfectly correct assertion. Having found the quantity of work done by the steam in one stroke of the piston, he can, of course, if he thinks he can get anything by the operation, multiply it by the number of strokes the engine makes in

the unit of time, and divide the product, &c.

I would suggest to "Ingénieur," that he should investigate the manner in which the work done by the piston is transmitted to the crank shaft, which can be done by means of a curve passing through points determined by co-ordinates, the abscissæ representing the lengths of equal arcs described by the centre of the crank pin, and the ordinates representing the products obtained by multiplying the pressure on the crank pin, at each division of the circle, by the corresponding effective length of the crank: he will thus obtain for one turn of the shaft two figures, which, if it were possible for the length of the connecting rod to be infinite, would be exactly alike; but this being impossible, they will be found to differ the more the shorter the connecting rod is with respect to the length of the crank; they will, nevertheless, be of equal area. My motive for making this suggestion is, that the diagrams thus constructed will prove to "Ingénieur" that his proposition has not the merit even of novelty. I am, Sir, yours, &c.,

MÉCANICIEN.

Paris, April 9, 1855.

To the Editor of the Mechanics' Magazine.

SIR,—As a desire for brevity and a fear of trespassing too largely on your valuable space prevented me in my first letter from entering into the subject of the indicated horse-power of steam engines as minutely as I could have wished, as the importance of the question demands that it should have justice, and as the vagaries and misconceptions of Mr. Emmett show either that I have not been sufficiently explicit, or that he has not duly considered my remarks, I think I am fully warranted in again pressing the subject upon your attention.

And first, a few words in reply to the observations of Mr. Emmett, in your number of the 31st March; though I must say that he possesses so extraordinary a knack of avoiding the real point in discussion, and in controversy *un style à lui*, not the least remarkable peculiarity of which consists in making mere assertion take the place of argument, that it is somewhat difficult to answer him without an appearance of severity bordering, perhaps, upon discourtesy.

Mr. Emmett tells us that he "cannot admit that, in finding the average pressure upon each inch of the piston, time, and consequently velocity, have anything to do with this part of the calculation." Now I am sure that the person who would desire him to admit any such thing must be very unconscionable. The possibility of finding the *average pressure* upon the piston by the indicator is beyond all doubt, and has never for a moment been disputed. The indicator does more; it shows us the pressure per square inch upon the piston, at whatever particular point of the stroke we wish to know it. It is, therefore, difficult to conceive a reason for Mr. Emmett's pertinacity in insisting that "the varying motion of the piston from bottom to top, or from top to bottom, can be no source of error in getting by an indicator diagram the average pressure of steam upon each inch of the piston of the engine." I wish Mr. Emmett distinctly to understand that the *average pressure* upon a piston and the horse power transmitted by that piston are two very different things. It is clear that he would have spared himself much trouble by a proper attention at the outset to the true subject of discussion.

Again, when Mr. Emmett states "Mécanicien" to be in error where he says, "The atmospheric line of the diagram represents at a *certain scale* the stroke of the piston in feet and fractions of feet," and myself to be in error where I say, "The area of the diagram is simply the length of the stroke multiplied by the average pressure upon the piston," he denies the indicator a property to which it owes all its value; for if the length of the atmospheric line has, as he says, "no relation to the length of stroke of the engine," how are we to find by the diagram the pressure upon the working parts of the engine at any particular part of that stroke? True, the length of the atmospheric line may be varied by giving the drum of the indicator a longer or shorter traverse; but what is the result? The diagram is still an equally correct miniature representation of the stroke of the piston and of the pressure upon the piston at any part of the stroke, though with the atmospheric line drawn to a *different scale*.

I will not allude to Mr. Emmett's two sentences in italics, on account of their length, excepting to say that I am sufficiently obtuse not to see any improvement in the first by the double emphasis laid upon the words "PISTON" and "PRESSURE," since the question in debate is not "to tell exactly the pressure upon each inch of the piston," nor "to take an indicator diagram for the purpose of calculating the horse power," but to calculate correctly the horse power after the diagram is taken. My inference, therefore ("since the velocity of the piston does not show the pressure upon the piston," &c.) was the only one that could be drawn. I am sorry that Mr. Emmett does not point out the "reckless assertions" which he says are to be found in my last letter, for I should have been happy to ex-

plain them to him, even at the risk of again laying myself open to so serious (?) a charge as that of "writing for victory."

* * * *

Having thus endeavoured to show your correspondent in what consists the error of the present system of calculation, I propose to demonstrate in a future number the accuracy ensured by my method of dividing the atmospheric line by lines projected from two quadrants of circles, as described in your number for February 17th.

I am, Sir, yours, &c.,

INGÉNIEUR.

[We have been compelled to shorten the foregoing letter considerably. ED.]

Manchester, April 5, 1855.

MR. MUSHET'S REPLY ON THE SMOKE QUESTION.

To the Editor of the Mechanics' Magazine.

SIR,—I am sure you have not a reader so devoid of intelligence, as to be at a loss, after so many weeks persevering elucidation, in understanding the difference between gas and smoke. It is even plain that Mr. Palmer knows it; why then write to mystify?*

* * * *

I will give Mr. Palmer the full benefit of the omission of the word "carburetted" before "hydrogen." I will not even attempt my exculpation at the cost of the compositor. If Mr. Palmer truly and faithfully believes that I intended to assert that hydrogen, one of the hitherto undecomposed elements, could be decomposed to carbon, he must have been sorely puzzled indeed.

I never submitted an Argand oil lamp to cold air as described, and can therefore give no opinion; but that a flame by being almost extinguished should increase in brightness, seems an extraordinary characteristic.

The abstract truism in the next paragraph ought to read thus: "A given quantity of fuel, supplied with a given quantity of cold air, will realise a certain effect, while the same quantity of combustible supplied with the same quantity of hot air, will produce a greater effect." If this is to be anything beyond mere words, it involves the necessity of the "astounding project."

Mr. Palmer turns the argument on Juckes's grate wrong end first. That it is the best "smoke consumer," is the *fact*, not the inference. The next fact is that the air is supplied especially cold; then comes the conclusion at which I arrive, that hot air is not required.

The last paragraph is a mistake. If Juckes's, or any other bars, were surrounded with hot air, so as to bend or melt them, it would not follow at all that more heat was generated in the furnace. This local injury might, and indeed certainly would be effected, though much less heat were generated in the proper place. Every one knows that bars stand because one narrow surface only out of four is exposed to the heat. To make them hot is by no means the best way to make the furnace hot.

Surely in reviewing this now thoroughly consumed discussion, we may add a wise saw to a modern instance, and say in truth, "He who comes with a mind to censure will find matter for his humour, but none for his instruction."

I am, Sir, yours, &c.,

DAVID MUSHET.

April 4, 1855.

* In reducing this letter, we have removed a paragraph in which the use of hot air is treated by Mr. Mushet.—ED.

COLONEL PARLBY'S BISECTING COMPASSES.

To the Editor of the Mechanics' Magazine.

SIR,—It is almost needless to state that an instrument which will bisect a line or an angle correctly and instantaneously, and also serve for other useful purposes in plan drawing, &c., must be a valuable addition to the usual case of drawing-instruments; and as such the following is freely offered to the attention of the makers of mathematical instruments, as likely to have a ready sale, if made at a moderate price.

With this instrument, by opening the points to measure the length of any line to be divided, and pressing down the steel slide, E, the point of division is immediately and accurately marked, dividing the line into two equal lengths, from the centre.

To bisect an angle, measure an equal length on each side of the angle from the vertex, by opening the points to any distance, and then placing the points of the compass across the opening of the angle to these points, the slide, E, if depressed, marks the true point, and a line drawn through this point will bisect the angle. By using the steel slide, E, as a centre, and having ink and pencil points fitted to the legs of the compasses, as usual, a circle may be drawn; and if joints are made in the legs, two concentric circles can be drawn, without shifting the centre.

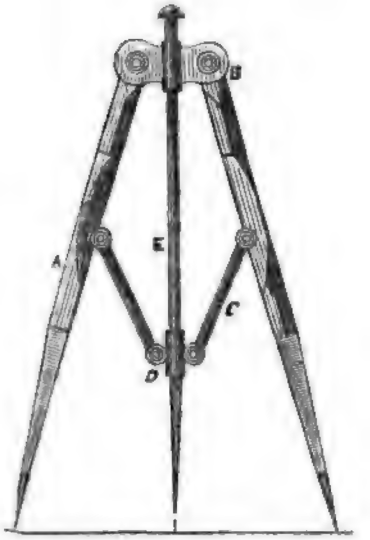
The centre of any given circle may also be immediately found by stretching the compass across the circle, in the direction of two diameters at right angles to each

other, when the sliding point, E, will immediately mark the centre of the circle.

I am, Sir, yours, &c.,
SAMUEL PARLBY.

Description of the Instrument.

The accompanying engraving represents the bisecting compass. The legs, A, are jointed independently at B, and carry two arms, C, connected by joints to themselves



and to the travelling socket, D. Through this socket, D, passes a steel pin, E, fitted so as to move smoothly through it, and also through a similar but fixed socket formed between the joints, B.

DOINGS IN OUR MATHEMATICAL PERIODICALS.

To the Editor of the Mechanics' Magazine.

SIR,—In the early portion of last year I brought before the notice of the public, and the readers of this Journal, certain practices which were resorted to by correspondents to our mathematical periodicals. It was there proved that some of these did not scruple to obtain solutions to the questions proposed, from every available source, and then forward them to the Editors as their own.

Since then I have had the pleasure of forming the acquaintance of several scientific gentlemen, from different parts of the country, and they inform me that, to their personal knowledge, the practice of procuring solutions from some kind and able friend has been carried on in their respective localities to a great extent. They were able to point out many solutions attributed to individuals who had never done anything more than transcribe the notes of another. I am led to believe that the correspondence to which I have just alluded was productive of some good, and that applications for solutions have been fewer of late than formerly. But the practice is not yet entirely extinct. One kind gentleman wrote to me some time ago, requesting me to furnish him with the solution to a certain question in one of our annuals, on condition that he would "supply me with any solutions I might desire to any of the other questions of which he had procured solutions." He backed his application with the statement that "the Cantabs had great advantages over self-taught men;" but, he added, "*we always manage to get solutions somehow or other.*" A second gentleman requested a "solution of the Prize, or any hints tending thereto," for he had "been able to make nothing of it" himself. Another has recently forwarded me a rude diagram, and a sheet of paper, in the hope that I shall "have no objection to complete the figure and write out the solution" to a question which he names;—whilst a fourth desires me to state what I mean by certain points in the enunciation, and "shall be glad of any hints respecting the demonstration." One of my friends also informs me that he has been pestered in a similar manner, and that one of these applicants expressed a hope that he would not fail to supply his wants, inasmuch as he supposed he could "*not but be gratified with seeing his namesake in print.*"

Such practices, in my opinion, cannot be too severely condemned. They take away from deserving men their due meed of praise, and those to whom no honour is due not unfrequently reap the reward of the labours of others. A prompt exposure of all such cases will, however, effect a great deal towards remedying the evil; and in the hope that your correspondents will look to the matter,

I am, Sir, yours, &c.,
T. T. WILKINSON.

Burnley, April 9, 1855.

MANUMOTIVE CARRIAGES.

To the Editor of the Mechanics' Magazine.

SIR,—In your last number, your correspondent, "Charles Gibbons" asks information, through your pages, respecting a manumotive carriage, capable of being worked by an invalid who has not lost the use of his arms. In reply, I beg to inform him that the master of the Post-office at the pleasant little watering-place, Portishead, in this county, is in possession of a machine

of this description, which appears to me, from the best of my recollection, to be exactly the thing to suit your correspondent. The post-master's name is Bennett; he appears to have entirely lost the use of his legs (I believe from chronic rheumatism). In my visits to Portishead, I have frequently seen him in the carriage, travelling about his garden and the village. So far as my observation has gone, the machine is propelled by means of two levers, worked by the rider's arms, and acting upon cranks in the axletree. I have not sufficient recollection of the machinery to send any drawing; but it appeared to be of simple construction, and capable of being worked without much labour.

If your correspondent would like to write to Bennett for further information, his address is, "Portishead, Somerset." Should the application be unsuccessful, I shall have great pleasure, upon my next visit to the village, to give the necessary particulars.

I am, Sir, yours, &c.,

THOMAS FULLER.

Bath, April 3, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in machinery for washing paper stock.* (A communication.) Patent dated September 20, 1854. (No. 2033.)

This invention consists in the employment, for washing rags or other paper stock, of a reticulated cylinder having open ends, rotating in a trough of water in which it is partly submerged, and receiving streams of water through one side, at one or at both ends, or at both the side and ends, the said cylinder being furnished with interior teeth and certain curb pieces.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in sewing-machines.* (A communication.) Patent dated September 20, 1854. (No. 2035.)

This invention applies to that description of sewing-machine which forms the stitch by the interlacing of two threads, one of these being passed through the cloth by a needle, and left protruding in the form of a loop, through which the other is carried by a shuttle or its equivalent.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *A new mathematical instrument, to be termed the "horometer," for the purpose of solving problems in plane and spherical trigonometry, one feature of which invention is or may be applicable in the construction of other mathematical instruments.* (A communication.) Patent dated September 20, 1854. (No. 2036.)

This invention consists in constructing an instrument upon which are delineated projections of latitude and longitude within an arc of a circle, and which is combined with an arm and scale, for the purpose of solving problems in spherical trigonometry without the usual mathematical calculations; and in the employment of electro-magnetism for keeping a slide perpendicular to a straight edge.

HUDSON, HENRY, of the South Shields Flint Glass Works, South Shields, Durham, glass-manufacturer. *Improvements in the manufacture of vessels for measuring fluids.* Patent dated September 21, 1854. (No. 2037.)

Claim.—The mode of making glass measures by pressure, with a plunger and mould or matrix, the plunger corresponding in shape and size to the interior of the measure, and the mould or matrix to the exterior of it.

SHARP, WILLIAM PRIOR, and WILLIAM WEILD, of Manchester, Lancaster, machinists. *Improvements in machinery for winding, cleaning, doubling, spinning, and throwing of silk.* Patent dated September 21, 1854. (No. 2038.)

These improvements consist in combining the operations of winding, cleaning, and doubling; in the application to doubling-machines of a cone or other differential motion for varying the speed of the bobbin; &c.

PASSET, JEAN ANTOINE, of Paris, France, machinist. *Improved machinery or apparatus for pressing or calendering fabrics.* Patent dated September 21, 1854. (No. 2039.)

In employing this improved machinery the fabric is drawn off from a roller, and after passing over and under guide-rollers is brought in contact with the surface of a heated cylinder by which it is drawn forward, its surface being rubbed against the surfaces of a pair of concave adjustable blocks; it then passes over other guide-rollers to a horizontal table, where glazed papers or boards are placed upon it, preparatory to its being passed between a pair of pressing rollers upon the upper of which it is finally wound.

HODSON, WILLIAM, of Kingston-square, Hull, tile-maker. *Improvements in apparatus for the manufacture of bricks, tiles, and other articles from plastic materials.* Patent dated September 21, 1854. (No. 2041.)

The inventor fixes a chamber at the bottom of the pug-mill, and in it places a rotating screw which forces the clay out in a continuous stream through an orifice. The sides and ends of the mould are made hollow, its inner surfaces having formed on them channels, which are covered with cross-

grained wood. Holes are made which lead from the hollow chamber of the mould to these channels, and water, which is constantly supplied to the hollow part of the mould, percolates through the cross-grained wood to the inner surface of the mould which is covered with fustian or other suitable material to give a smooth surface to the stream of clay as it passes through the mould. The clay, as it is expressed from the moulding orifice, is received upon a pallet placed on a rising and falling frame which is balanced by a weighted lever or spring, and is separated by a wire guided by a frame so as to cut off the proper sized brick, tile, or other article.

GWYNNE, JAMES EGLESON ANDERSON, of Essex-wharf, Essex-street, Strand, Middlesex, engineer. *Improvements in machinery for lifting, forcing, and exhausting.* Patent dated September 22, 1854. (No. 2043.)

This invention comprises the introduction of curved diaphragms into the water passages of pumping machinery, for the purpose of giving to the entering water an easy motion in the direction of the piston, and preventing its requiring a circular motion; an improved construction of piston or wheel; and an improved method of compensating for the wear of the piston or sides.

JOHNSON, JOHN HENRY, of Lincoln's-inn Fields, Middlesex, gentleman. *Improvements in machinery or apparatus for manufacturing cards employed in the preparation of fibrous materials.* (A communication.) Patent dated September 22, 1854. (No. 2044.)

This invention relates—1. To the piercing of the bands or sheets of leather, into which the wire teeth are to be inserted. 2. To the feeding of the wire into the inserters. 3. To the holding of the wire during the action of the doublers or benders. 4. To the cutting of the wire. 5. To the doubling or bending of the wire. 6. To the introduction of the wire into the leather. 7. To a mode of inclining the teeth. 8. To a mode of actuating the leather while inserting the card teeth.

HOLLAND, HENRY, of Birmingham, Warwick, umbrella and parasol manufacturer. *Improvements in the manufacture of umbrellas and parasols.* Patent dated September 22, 1854. (No. 2045.)

Claims.—1. A mode of strengthening the tubular ribs of umbrellas at the parts where they are connected to the stretchers by inserting therein a soft steel wire. 2. A mode of constructing and strengthening the forks of stretchers of umbrellas and parasols, when such stretchers are composed of steel tubing, by inserting therein a soft steel or iron pin, or short length of wire, which is afterwards split to the required extent for forming the fork.

LAWRENCE, THOMAS, of Birmingham, Warwick, manufacturer. *Improvements in machinery or apparatus to be employed for the purpose of shaping and finishing certain parts of bayonets.* Patent dated September 22, 1854. (No. 2046.)

This invention consists in constructing apparatus to be employed for the purpose of turning, cutting, or grinding the sockets, rings, necks, collars, and shoulders of bayonets, instead of shaping and filing those parts by hand labour.

SPENCE, PETER, of Pendleton, Lancaster, manufacturing chemist. *Improvements in obtaining sulphur from iron pyrites, and other substances containing sulphur.* Patent dated September 22, 1854. (No. 2047.)

This invention consists of improvements upon a former patent of the inventor, dated July 24, 1854,* and consists in the production of sulphur, by combining in one chamber pyrites or other matters containing sulphur, with coke, charcoal, or other solid carbonaceous or deoxidizing matters kept at a red heat.

COLLIER, GEORGE, of Halifax, York, manager, and SAMUEL THORNTON, of Rochdale, Lancaster, machinist. *Improvements in looms for weaving.* Patent dated September 22, 1854. (No. 2048.)

This invention consists—1. In the employment of cams or tappets for shedding the warp, such cams or tappets being governed in their action by an endless chain of pegs, jacquard cards, or equivalent apparatus. 2. The employment of a certain lever, the extremity of which is below the centre of motion, for letting off the warp. 3. In the use of catches acting directly upon the needles for maintaining the shed, and also for affording the means of gaining a level warp. 4. In mounting the rods which carry the shafts in apparatus which will admit of their being separated from each other by hand; also in mounting the shafts upon sockets, capable of being adjusted as to height upon rods.

GARNETT, THOMAS, of Liverpool, Lancaster, engineer. *Improvements in steam engines and other governors.* Patent dated September 23, 1854. (No. 2050.)

This invention consists in the construction of centrifugal governors, in which solid or fluid bodies are so arranged, that by the variation of the centrifugal force, they shall move in an arc or arcs, coincident with, or parallel to the arc of a common parabola.

FELOJ, PIETRO, of Fleet-street, London, confectioner. *Improvements in the manufacture or construction of a knife and fork.*

* See *Mech. Mag.*, No. 1645, p. 161.

Patent dated September 23, 1854. (No. 2051.)

This invention consists in constructing the blade of a knife so as to answer the double purpose of a knife and fork, which is accomplished by making one or more slits in the blade to form the prongs similar to a fork, and sharpening the edge of either the inner or outer prong, to answer the purpose of a knife.

BANKS, THOMAS, of Derby, mechanical engineer, and HENRY BANKS, of Wednesbury, Stafford, iron merchant. *Improvements in apparatus for retarding and stopping railway trains.* Patent dated September 23, 1854. (No. 2052.)

This invention consists in certain modifications of the apparatus patented by the inventors, July 26, 1853.*

HOSKINS, SAMUEL ELLIOTT, M.D., F.R.S., of Guernsey. *An improvement in the manufacture of paper.* Patent dated September 23, 1854. (No. 2053.)

This improvement "consists in the application of the plant known by the name of *cyperus longus*, the English name being Galingale, to the manufacture of paper."

PINKNEY, ROBERT, of Long-acre, Middlesex, ink-manufacturer. *Improvements in stoppers, corks, or valvular apparatus for bottles, or receptacles for liquids, and in the machinery or apparatus employed for making the same.* Patent dated September 23, 1854. (No. 2055.)

In carrying out this invention, the neck of the bottle is formed with two lateral slots or holes corresponding with passages in the stopper, so that when the latter is in its place the user has only to turn it partially round to open or shut off the flow from the bottle.

MCNAUGHT, GEORGE, of Glasgow, Lanark, saddletree-maker. *Improvements in saddletrees.* Patent dated September 23, 1854. (No. 2056.)

This invention consists in a mode of forming the heads and side-bars of saddletrees, by cutting suitable pieces of wood to the required thickness and then bending them into form, after being steamed or otherwise prepared, by means of suitable machinery; and in the use, in the construction of saddletree heads, of separate sections or layers of wood combined to produce the thickness and solidity required.

DANRÉ, GEORGES, of Marseilles, France. *Certain improvements in gas burners.* Patent dated September 23, 1854. (No. 2057.)

This invention consists "in certain contrivances for heating, expanding, and regulating the volumes of air and gas for the purpose of effecting a complete combustion of the latter, and in adding to this threefold action a double reflection of light, one of them being produced by an appendage or part of the burner, and the other resulting from the rays first reflected being received and sent back by means of an ordinary reflector superadded."

* See *Mech. Mag.*, No. 1591, p. 114.

GENETREAU, HENRY ALEXANDRE, of Paris, France. *An improved system of carriage-shafts, poles, or beams.* Patent dated September 23, 1854. (No. 2058.)

Claim. — "The use and application of whalebone, and also of bamboo cane, or any other similar exotic reed, in the construction of carriage-shafts, poles or beams."

MC CONNEL, ROBERT, of Glasgow, Lanark, iron-founder. *Improvements in locks.* Patent dated September 25, 1854. (No. 2060.)

The improved lock described by the inventor is so constructed that when the bolt is shot and the key removed it cannot be shot back without first being moved a short distance further out. The bolt and tumblers and the key are so constructed that this double motion of the bolt is effected in the regular course by turning the key in one direction only, as in ordinary locks.

CHABOT, PHILIP JAMES, of Spitalfields, Middlesex. *Improvements in supplying air to furnaces.* Patent dated September 25, 1854. (No. 2061.)

The inventor employs a forcing apparatus and forces air through a rosehead into the furnace above the fuel on the firebars.

RUOLZ, HENRI CATHERINE CAMILLE DE, and ANSELME LOUIS MARIE DE FONTENAY, both of Paris, France, civil engineers. *Improvements in the treatment of certain metals for producing an improved metallic alloy.* Patent dated September 25, 1854. (No. 2063.)

This invention relates to a modification of a former patent of the inventors, dated December 30, 1853,* and consists in the introduction (and in certain cases the elimination) of phosphorus in the manufacture of alloys of silver or other metals.

SURGEY, WILLIAM PALMER, of Hackney, Middlesex, gentleman. *Improvements in cigars, cigarettes, and cheroots.* Patent dated September 25, 1854. (No. 2064.)

This invention consists in tipping cigars, &c., with an ignitable composition, which may be fired by friction.

HALSEY, JOSHUA BACHELER, mining engineer, of Norfolk-street, Strand, Middlesex. *An improved machine or apparatus for crushing and pulverizing ores, and separating the gold therefrom by amalgamation.*

* See *Mech. Mag.*, No. 1614, p. 66.

Patent dated September 26, 1854. (No. 2065.)

This machine consists principally of a large circular basin having a flat bottom divided into compartments or troughs by angular ridges or rims. In the outer compartments are placed edge-runners connected to an upright shaft in the centre and revolving both round the trough and upon their own axes, for the purpose of crushing the ores. Behind the edge-runners are ploughs or scrapers which turn over the ore to prevent its packing and to bring it directly into the course of the runners. In the inner troughs are placed scouring plates or drags connected to arms radiating from the vertical shaft, for the purpose of polishing the gold and bringing it into frictional contact with the mercury. A stream of water carries the ore from the outer through the inner troughs.

CORNIDES, LOUIS, of Trafalgar-square, Middlesex. *A new mode of manufacturing a transparent medium, plain, printed, and coloured, of gelatine, in combination with other substances.* Patent dated September 26, 1854. (No. 2066.)

Claims.—1. Coating glass with gelatine combined with sugar and water, so as to make the same adhere to the glass and be transparent, and be capable of being coloured with the transparent colours, according to a former invention of the patentee's.* 2. The process of colouring the gelatine with water-colours by covering the same first with the waterproof medium and then removing it. 3. Combining gelatine and collodium or other transparent varnishes as a transparent coating for glass. 4. The combination of gelatine with collodium and other transparent varnishes as a separate transparent medium. 5. Making, impressing, and colouring such separate transparent medium by certain described processes.

BOULTON, JOSEPH, of Coppice-row, Clerkenwell, Middlesex. *Improvements in dry gas-meters.* Patent dated September 26, 1854. (No. 2067.)

The inlet or supply-pipe of the improved meter communicates with two measuring chambers, formed one on each side of a vertical partition, in such manner that when the supply of gas is passing into one of these chambers that which has previously passed into the other is passing out into a receiving chamber on the other side of a movable diaphragm, and the gas so passed out, when the valve has moved far enough, passes out of the receiving chamber into an upper or valve chamber, and thence to the burners.

* See *Mech. Mag.*, No. 1610, p. 568.

SPENCER, GEORGE, of Alpha-road, New Cross, Deptford. *Improvements in the external coverings of roofs and walls of buildings and sheds, and in the windows of such buildings and sheds.* Patent dated September 26, 1854. (No. 2068.)

These improvements consist in the use of corrugated plates of glass, either plain or coloured, in the roofs and walls of railway sheds and conservatories, or other buildings where light and lightness of appearance are required.

CLAYTON, THOMAS, of Oldham, mechanic, and ROBERT HARROP, of Lowside, near Oldham, Lancaster, mechanic. *Improvements in ornamenting wood, and in the machinery or apparatus connected therewith.* Patent dated September 26, 1854. (No. 2070.)

Claim.—Transferring designs of the grainings or marking of the choice woods, as mahogany, rosewood, oak, &c., from engraved heated metallic rollers (or flat dies, if preferred) to surfaces of common or cheaper woods, such as deal or pine, whereby a close imitation of such choice woods is produced; and also the transferring of other ornamental designs from engraved heated metallic rollers (or flat discs, if preferred) to the surfaces of wood, as well as the described machinery or apparatus for the above purposes.

SINCLAIR, the Honourable JAMES, commonly called Lord Berriedale, of Hill-street, Middlesex. *Improvements in treating, cleansing, and ornamenting paper and other surfaces.* Patent dated September 26, 1854. (No. 2071.)

Claims.—1. The use of rollers or rotating parts carrying strips of caoutchouc or other soft and elastic substances, for the purpose of treating, cleansing, ornamenting, finishing, and polishing paper, woven fabrics, leather, yarns, threads, and other surfaces by the frictional contact therewith of the caoutchouc composing such rollers. 2. The mode of cleansing or removing colouring matter from paper and other surfaces by the action of rotating caoutchouc or elastic edge or surface pieces.

GRIFFITHS, THOMAS, of Madeley, Shropshire. *An improved pump for raising and forcing water.* Patent dated September 26, 1854. (No. 2072.)

This pump is constructed so as to divide the column of water or other liquid into sectional lifts, each lift, except the lower one, being open at the top to the atmosphere. By these divisions of the entire column into sectional parts, the pressure of the water upon the rising mains is to be reduced, and in a great measure equalized, whereby pipes of less strength, and consequently of less weight and cost may be used.

HOLLAND, JOHN SIMON, of Woolwich, Kent, engineer. *Improvements in large and small fire-arms, and in the preparation of their charges.* Patent dated September 27, 1854. (No. 2073.)

Claims.—1. The mode of fixing a rod to a disc or plug in such manner that the rod must be broken before pressure can come upon the shot or projectile, or when fixed to a disc at one end and to the shot at the other the rod shall be broken before the shot can move. 2. A mode of making a cartridge with a core, as described. 3. The enlargement of the bore at the breech. 4. The mode of testing the barrels and registering their defects, by forcing water into them, and observing if any and what deflection is thus produced.

BARRACLOUGH, CHARLES, of Halifax, York, mechanic. *Improvements in machinery or apparatus for the manufacture of clog soles and patten soles by power.* Patent dated September 27, 1854. (No. 2075.)

Claim.—The manufacture of clog soles and patten soles by means of a rotating wheel and revolving or rotating cutters.

EDGE, JONATHAN, of Bolton-le-Moors, Lancaster, engineer. *Improvements in pistons.* Patent dated September 27, 1854. (No. 2076.)

This invention consists in so constructing the metallic packing of a piston that the piston lid and block, or either of them, when tightened together by tightening screws, cause the packing ring to expand to fit the cylinder in which the piston works, the said packing ring being a solid hoop of metal which will yield to pressure and is not cut like the metallic packings hitherto employed.

RENFREW, ROBERT, of Glasgow, Lanark, smith. *Improvements in bobbins.* Patent dated September 27, 1854. (No. 2079.)

According to this invention, the barrel or spindle portion of the bobbin is made of any suitable material, "and the end discs or flanges are made of gutta percha, or of a composition wherein gutta percha is an ingredient, or of other suitable material or composition possessing the like qualities. Papier maché or pasteboard material may also be used for this purpose."

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in ovens or furnaces for melting or manufacturing glass.* (A communication.) Application dated September 20, 1854. (No. 2030.)

This invention is carried out by forming the oven or furnace-chamber with partitions, the glass or matters under treatment being passed alternately by above and below these partitions and finally conducted into a second oven where the glass is worked.

SAVARY, JEAN BAPTISTE EDOUARD, and JULES FELIX HAZARD, both of Paris, France, engineers. *Improvements in pumps.* Application dated September 20, 1854. (No. 2031.)

The inventor describes a double-action pump, in which the in-flow and out-flow pipes are each connected by a branch pipe to the top and bottom of the barrel, suitable valves being supplied.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *A new or improved governor for engines and machinery.* (A communication.) Application dated September 20, 1854. (No. 2034.)

This invention consists in governing the speed of engines directly by the resistance of the machinery driven, and not by the varying velocity consequent upon variations in the power and resistance.

MONEYMENT, MATHEW, of Lamb's Conduit-street, Holborn. *Improvements in hat, bonnet, and other boxes.* Application dated September 31, 1854. (No. 2040.)

This invention relates to that class of hat and other boxes which are made of scale-board, veneer-board, paper, or paste-board, and consists in rendering them water proof, by applying to the outside, or inside, or to both, any suitable water-proof varnish.

CROFTS, WILLIAM, of Derby-terrace, Nottingham-park, lace-manufacturer. *Improvements in the manufacture of fringes, and other plain and ornamental fabrics.* Application dated September 22, 1854. (No. 2042.)

This invention relates to certain modifications of machinery patented by the inventor, April 1, 1853.*

BROWN, WILLIAM JAMES, in the employ of Messrs. Ames, Bush, and Co., of Bristol. *Improvements in a composition or combination of materials to be used for sizeing yarns and other articles.* Application dated September 22, 1854. (No. 2049.)

This invention consists in using the following materials for sizeing yarns and other articles; viz., glue of commerce, soft soap, and nitrate of potash. These are mixed with flour and water, and when boiled are ready for use.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the generation of steam.* (A communication.) Application dated September 23, 1854. (No. 2054.)

* See *Mech. Mag.*, No. 1575, p. 311

These improvements consist, first, in the employment of a peculiar apparatus for drying and surcharging or superheating the steam before using it. Second, in a certain arrangement of evaporating apparatus to be used in connection with steam boilers.

MARSHALL, WILLIAM, of Wachinghem, Pas de Calais, France, gentleman. *An improvement or improvements in metallic wheels for railway and other purposes.* Application dated September 25, 1854. (No. 2059.)

The inventor forms a number of pieces with alternate projections and depressions, and places them side by side with the projecting ribs of one piece fitting into the depressions of the next, and then binds the whole together with a circular bar, by means of pressure.

BIGG, HENRY HEATHER, of Leicester-square, Middlesex, anatomical instrument maker. *Improved apparatus for curing deformities of the frame.* Application dated September 25, 1854. (No. 2062.)

In applying the improved apparatus to part of a limb, the foot for example, the latter is secured in a sliver or frame which is jointed to another frame that receives the leg, the joints of the two parts being made in such manner that the shoe may be turned in any direction according to the peculiar nature of the deformity, and elastic springs are attached in such manner as to produce a regulated strain in the required direction.

SADLER, WILLIAM FLOWERDEW, of Tooley-street, Southwark, Surrey, millwright, engineer, and manufacturer to the Government of submarine apparatus for the recovery of sunken property. *A machine or apparatus for using up all the smoke of furnaces and other fireplaces.* Application dated September 26, 1854. (No. 2069.)

The object of this invention is the production of a draught from the end of the furnace through a channel into the fire again, so that the gases and smoke may be conducted back to the fire.

M'MINN, WILLIAM KIMMINS, of Robert-street North, Liverpool, Lancashire. *Letting go and heaving up ships' anchors, which he calls a double-acting anchor purchase.* Application dated September 27, 1854. (No. 2074.)

This invention consists in the employment of two metal wheels with depressions on their circumferences to receive one half of each link of the chain; in the use of an eccentric and lever, with friction rollers to relieve or to compress the chain and act as stoppers by bringing two or more parts into close contact with each other; and in the use of a cylinder with a spiral thread on its inner surface, to act as a relieving or permanent stopper for hemp cables or ropes.

CHAMBERS, JOHN, of Manchester, engineer. *Improvements in washing fabrics, and in machinery employed therein.* Application dated September 27, 1854. (No. 2077.)

The apparatus employed by the inventor consists of a cylinder supported by trunnions, one of which is furnished with three passages through which the water and steam for washing the fabrics are admitted, and all of which are in connection with perforated pipes attached to the inner circumference of the cylinder.

HOYLE, ROBERT, of Whitehead-bridge, Bury, Lancaster, machine maker. *Improvements in preventing incrustation in steam-boilers.* Application dated September 27, 1854. (No. 2078.)

This invention consists in placing a perforated vessel, containing bark or other suitable matter, in a cistern partly filled with water, which may be heated by the waste steam or water from a steam engine or otherwise, and the solution of bark or other matter thus formed is forced into the boiler.

CROSSE, ARETAS YOUNG, of Blackheath, Kent. *Improvements in the manufacture of buttons.* Application dated September 28, 1854. (No. 2081.)

This invention consists in making the upper part of the button movable, so that different sets of buttons, varying in material and design, may be readily applied to the garment to which the shanks of the buttons are fastened.

SIMPSON, JAMES, of Rochdale, Lancaster, woollen manufacturer. *An improvement in the manufacture of printers' blankets.* Application dated September 28, 1854. (No. 2083.)

This improvement consists in the employment of a worsted warp instead of the ordinary warp, the weft of the cloth being of wool as usual.

PROVISIONAL PROTECTIONS.

Dated March 19, 1855.

605. Benjamin Cook, of Chester-street, Kennington, Surrey, furnace builder. Improvements in machinery or apparatus for consuming smoke.

607. John Rimell, of Covent-garden, Middlesex, esquire. A substitute for the turpentine ordinarily employed in mixing paints and colours. A communication.

609. Richard Howson, of Lancaster, engineer. Improved means of increasing the motive effect of screw-propellers, and of diminishing resistance to motion in vessels propelled.

611. James Taylor, of Southwark, Surrey, doc-

tor of philosophy. An improved means of consuming smoke in furnaces and fire-places.

613. Philippe Roehrig, of Paris, France. A new or improved alimentary substance.

615. John Smalley, of Bishopsgate, Wigan, Lancaster, accountant. Improvements in railway-carriage axles.

617. Alexander Robert Terry, of Adelphi-terrace, Adelphi, Middlesex. Improvements in apparatus for copying letters and other documents.

Dated March 20, 1855.

619. Archibald White, of Great Missenden, Buckingham, conveyancer and land agent. Swinging beds, which will enable soldiers and others to sleep dry in tents or huts, and occasionally in the open air.

620. Jonathan Musgrave, of Bolton-le-Moors, Lancaster, engineer. Improvements in steam engines.

621. William Taylor, of Poolstock, Wigan, Lancaster, picker manufacturer. Improvements in the construction of pickers for power-looms.

622. Thomas Mara Fell, of King William-street, London, and Francis Squire, of the same place, civil engineers. Improvements in balance levers, and apparatus for weighing, and modifications thereof, for the purpose of detecting base coin.

623. Thomas Stevenson, of Little Bolton, Lancaster, mechanic. Improvements in machinery or apparatus for gasing yarns.

624. Charles Marsden, of Kingsland-road, Middlesex, ventilation engineer. An improvement in tent-poles.

625. Benjamin O'Neale Stratford, earl of Aldborough, of Stratford Lodge, Wicklow, Ireland. Improvements in aerial navigation, and in the application of the same to warlike purposes.

626. Edward Taylor Bellhouse, of the Eagle Foundry, Manchester, Lancaster, engineer, and David Longsdon, of Grafton-street, Fitzroy-square, Middlesex, civil engineer. Improvements in the preparation or manufacture of materials for coverings for buildings and other purposes, such coverings being specially applicable to barracks and military storehouses.

628. Auguste Edouard Loradoux Bellford, of Essex-street, London. A new and improved governor for engines and machinery. A communication.

629. Isaac Rogers, of North Haverstraw, New York, United States of America. Improvements in the mode of treating iron ores.

630. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for forming moulds for casting. A communication.

Dated March 22, 1855.

631. William Miller, of North Leith, Midlothian, Scotland, gentleman. An improved apparatus for the prevention of smoke and promoting ventilation.

632. John Morrison, of Birmingham, Warwick, machinist. An improvement or improvements in the manufacture of metallic pens.

633. Tell Claude François Lecour, of Paris, France, mechanical engineer. Improvements in locomotion on canals and rivers.

634. James Biden, of Gosport, Hants, gentleman. Improvements in marine steam engines.

636. Matthew Semple, of Plymouth, Devon, gentleman. Improvements in railway-breaks.

637. William MacNaught, of Rochdale, Lancaster, engineer. Certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.

638. Charles Carnell, of Philadelphia, Pennsylvania. Certain improvements in the manufacture of bricks.

639. John Scott Russell, of Millwall. Improvements in ship-building.

Dated March 23, 1855.

640. George Whyatt, of Openshaw, Lancaster, dyer. Certain improvements in machinery or apparatus for cutting piled goods or fabrics.

641. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery for combing wool and other fibrous materials. A communication from Francis Joseph Bousses, of Fournes, France.

642. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in hydraulic motive power engines. A communication from Narcisse Duvoir, of Liancourt, France, mechanical engineer.

643. Henry Joseph Morton, of Leeds, York, galvanized iron merchant and contractor. Improvements in the construction of gas-holders or gasometers.

644. Charles Frederick Behn, of the Commercial Sale Rooms, London. Improvements in machinery for making moulds for casting metal. A communication from David Brown, of Baltimore, United States of America.

645. Frederick Ransome, of Ipswich. An improvement in the manufacture of artificial stone.

646. William Young, of Queen-street, Cheapside, London. Improvements in stoves or fire-places.

Dated March 24, 1855.

647. James Willis, of Cheapside, London. Improvements in certain parts of the frames and furniture of umbrellas and parasols.

648. John Louis Bachelard, of Charles-terrace, Old Kent-road, Surrey, gentleman, and Henry Harvey, of Denbigh-street, Pimlico, Middlesex, gentleman. Making an animal manure for all agricultural, horticultural, and floricultural purposes by reducing the flesh and bones of all or any of the animals of the earth and fishes of the sea to a pulp, powder or jelly, with or without the aid of alkali.

649. Uriah Scott, of Duke-street, Adelphi, Middlesex, engineer. Certain improvements in the construction of carriages and of the various parts of the same.

650. Robert Joseph Jesty, of the Great Northern Railway, King's-cross, Middlesex, station master. Improvements in apparatus for indicating between parts of a train of carriages on a railway.

651. David Elder, junior, of Glasgow, Lanark, engineer. Improvements in moulding or shaping metals.

652. James Niven, of Keir, Perth, gentleman. Improvements in the manufacture of paper, and in the production of textile materials.

653. T. F. E. Clewe, of Paris, France. A new construction of locomotive engines, tenders, and railway carriages.

654. Griffith George Lewis, C.B., major-general, Royal engineers, of Woolwich, Kent, and Joseph Gurney, of St. James'-street, Middlesex, military tailor. An improved construction of knapsack, convertible when required into a bed, a litter, or a tent.

655. William Brown, of Gresham-street, London, warehouseman. An improved mode of preparing sewing silk for the market.

656. Lewis Frederick Edwards, of New Bridge-street, London, gentleman. An improvement in furnaces. A communication.

Dated March 26, 1855.

658. Robert Sam North, of Gorton, near Manchester, Lancaster, engineer. Improvements in the permanent way and sidings of railways.

660. John Gedge, of Wellington-street South, Middlesex. Improvements in machinery or apparatus for forming corners or curves. A communi-

cation from Charles Sester, of Beaume les Dames, France.

662. George Allam Barrett, William Exall, and Charles James Andrewes, of Reading, Berks. Certain improvements in portable and fixed combined threshing machines.

664. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for dressing flax, hemp, and other fibrous materials. A communication from Jean Jacques Alexandre Lallier, of Evreux, and François Jules Vignaud, of Paris, France.

666. Claude Antoine Busson, engineer, of Paris, France. Improvements in feeding apparatuses applicable to machines for treating textile materials.

668. Francis Crossley, M.P., of Halifax. Improvements in the manufacture of mosaic rugs.

670. Alexander William Williamson, of University College, Gower-street, Middlesex. Improvements in stoves or fire-places.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April* 10*th*, 1855.)

2505. Alfred Vincent Newton. Improvements in steam boiler and other furnaces. A communication.

2514. Sir James Caleb Anderson. An economical railway for the conveyance of passengers, goods, and letters.

2515. Edward Welch. Improvements in fire-places and flues, and apparatus connected therewith.

2522. Charles Murray. Improvements in the manufacture of ordnance, barrels of fire-arms and hollow cylinders of iron.

2546. Robert Shaw. Certain improvements in looms for weaving.

2551. James Porritt. A certain improvement or improvements in carding machines.

2552. Daniel Collet. Improvements in transmitting power.

2565. James Anderson. Improvements in bending and shaping angle and bar iron for ship-building and other purposes.

2567. Christopher Hodson and James Whitley Stead. Improvements in machinery or apparatus for washing or cleansing woven fabrics and clothes, part of which apparatus is also applicable to churning milk and cream.

2585. John Thom. Improvements in apparatus for singeing or firing cotton and other fabrics.

2590. Gustav Adolph Buchholz. Improved machinery applicable to the hulling or cleaning of grain, seeds, and other vegetable produce.

2604. William Grindley Craig. Improvements in railway axle-boxes and spring fittings.

2629. John Court, junior. Improvements in rockets.

2667. James Cunningham. Improvements in starching textile fabrics.

2668. John Henry Johnson. Improvements in the extracting tannic acid from leather, and in preparing the leather for the manufacture of glue. A communication from Obadiah Rich, of Cambridge, Massachusetts, United States of America.

2692. William Bertram. Improvements in the manufacture of iron ships, steam and other boilers, bridges and other structures where numerous sheets of iron are used.

2742. Gerd Jacob Bensen. An improvement in refining sugar.

2753. Henry Richardson Fanshawe and John Americus Fanshawe. Certain improvements in the manufacture of various kinds of waterproof garments.

101. John Greenwood. Certain improvements in sizeing, stiffening, and finishing textile fabrics or materials.

393. Robert McConnell. Improvements in finishing or dressing textile fabrics.

409. Barnaby Angelo Murray. Improvements in winding, doubling, and twisting silk, flax, and other fibrous substances.

452. Stanislas Vigoureux. Certain improvements in printing, ornamenting, and dressing woven and textile fabrics.

474. William Johnson. Improvements in cleansing and preparing fibrous materials. A communication from Samuel W. Brown, of Lowell, Massachusetts, United States of America.

553. William Prockter Stanley. An improvement in, or addition to, clod-crushers.

581. William Lister. An improved implement for raising or loosening turnips and other roots in the ground, and cutting off the tails thereof.

591. William Hill. Improvements in metallic pens and penholders, and in ornamenting metallic pens and penholders.

620. Jonathan Musgrave. Improvements in steam engines.

625. Benjamin O'Neale Stratford, Earl of Aldborough. Improvements in aerial navigation, and in the application of the same to warlike purposes.

639. John Scott Russell. Improvements in ship-building.

645. Frederick Ransome. An improvement in the manufacture of artificial stone.

651. David Elder, junior. Improvements in moulding or shaping metals.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed April 6, 1855.

2170. Henry Crosley.
2177. Robert Cruise.
2179. Thomas Shaw and Richard Dixon.
2207. Thomas Edwin Moore.
2268. John Rickhuss and Charles Toft.
2300. Claude François Vauthier.
2316. Archibald Craig.
2408. Lancelot Kirkup.
2553. Thomas Cooper.
2671. William Porter Dreaper.

1855.

237. James Howard.
295. Alfred Vincent Newton.
310. Charles Barnard and John Bishop.

Sealed April 7, 1855.

2186. François Alexander Nicolas Delsarte.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

J. Simson.—We do not at present know the horse-power of the engine you mention, but will ascertain for you.

D. Mushet.—Yours in our next.

If *C. M.*, whose letter on Astronomical Clocks appeared in No. 1643, page 110, will favour us again with his address, we shall feel obliged.

*** All communications intended for publication in the following number, must reach us, at the latest, by Wednesday morning's delivery. They should, when convenient, be forwarded earlier in the week.

CONTENTS OF THIS NUMBER.

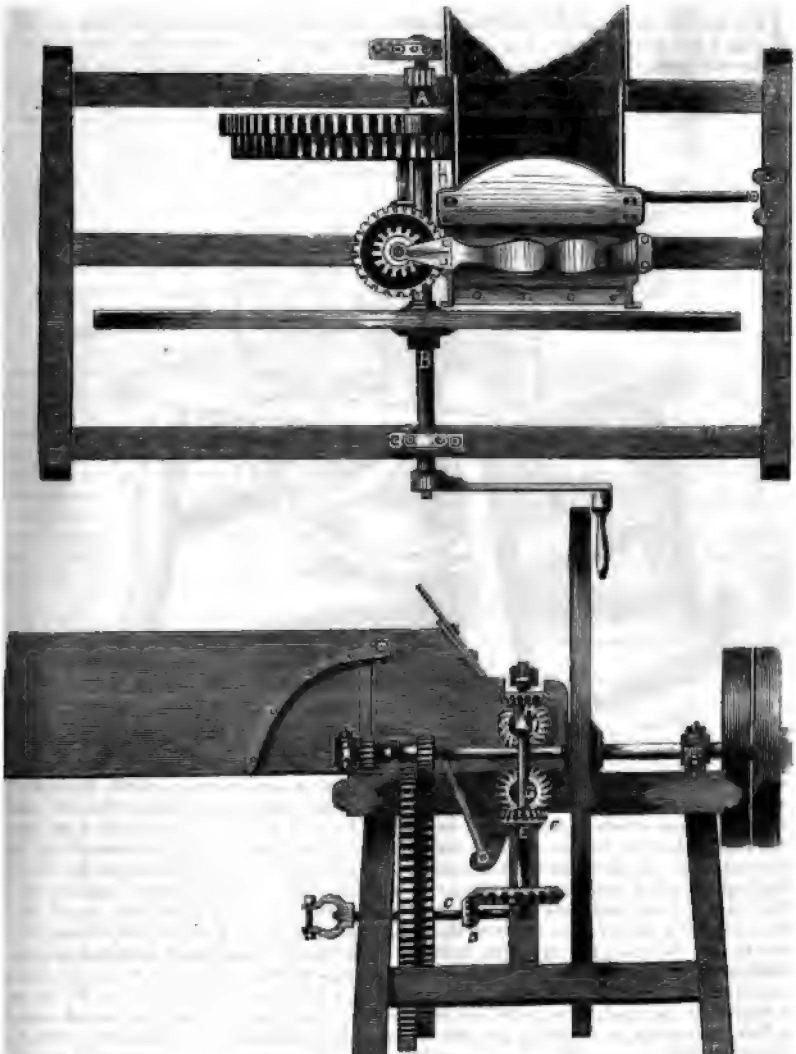
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne Paris;] Mason and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1654.] SATURDAY, APRIL 21, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

DRAY'S PATENT CHAFF-CUTTING MACHINE.



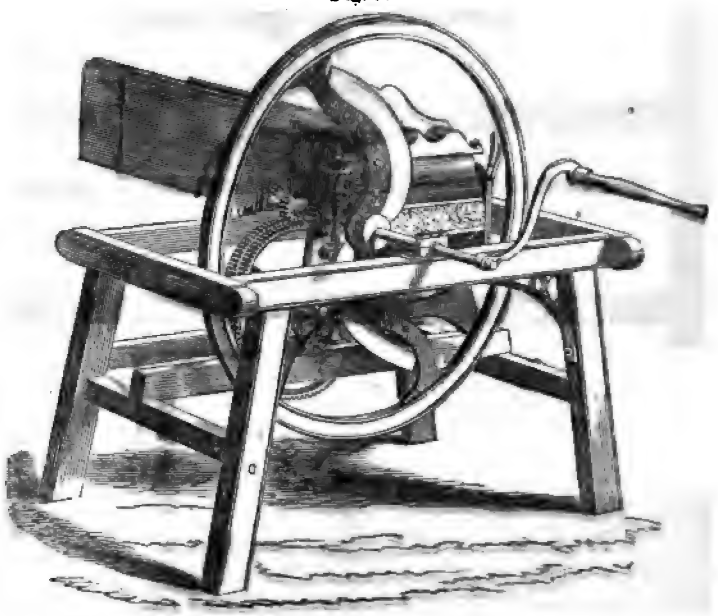
1

DRAY'S PATENT CHAFF-CUTTING MACHINE.

Mr. Dray, the agricultural implement manufacturer, of Swan-lane, London-bridge, has recently obtained Letters Patent for an improved chaff-cutting machine, in which the gearing for communicating the necessary motions to its working parts is so arranged that, without stopping the machine, the quantity of feed and the speed of the feed-roller, and therefore the length of the chaff cut by the knives, may be regulated by raising and lowering the feed-roller; an arrangement which manifestly gives to the new machine great advantages over existing apparatus.

The method by which the invention is carried into effect is as follows:—Upon the shaft, B, (fig. 1.) of the fly-wheel is a pinion, A, which gears into a spur-wheel keyed upon a horizontal shaft, C, (fig. 1.) fitted below the fly-wheel shaft. This shaft, C, has keyed upon it a bevel-pinion, D, working into a bevel-wheel keyed upon a vertical shaft, E. On this

Fig. 3.



shaft is also keyed a mitre-wheel, F, which gears into a similar mitre-wheel, G, upon the end of the lower roller; and on the upper end of the vertical shaft, E, is another mitre-wheel, the boss of which has formed in the inside of it a groove, into which a feather on the shaft takes for communicating the necessary rotary motion. This mitre-wheel gears into a similar one upon the shaft of the upper roller, and the two are so connected together that upon a rising motion being given to the upper roller to regulate the quantity of the feed, the mitre-wheels shall still remain in gear. In order to regulate the speed of the rollers there is keyed upon the same shaft, C, as the spur-wheel a second and similar wheel, but of less diameter, and upon the knife or fly-wheel shaft is placed a second pinion, of sufficient diameter to gear into the lesser of the spur-wheels. This pinion is keyed (together with the first-named pinion, A,) upon a hollow tube formed with a groove fitting upon a feather on the shaft, so as to be free to slide upon the fly-wheel shaft when acted upon by a fork and handle, and thereby to allow either of the pinions to be brought into gear with its corresponding spur-wheel, and these being of different diameters, the length of feed is regulated accordingly. The whole of the gearing is placed within the framework of the machine, as shown in the perspective view, (fig. 3), and the bearings and working parts are so nicely adjusted, that a boy is able to work the cutting-wheel of one of these implements with facility.

ON THE BLASTING OF ROCKS.*

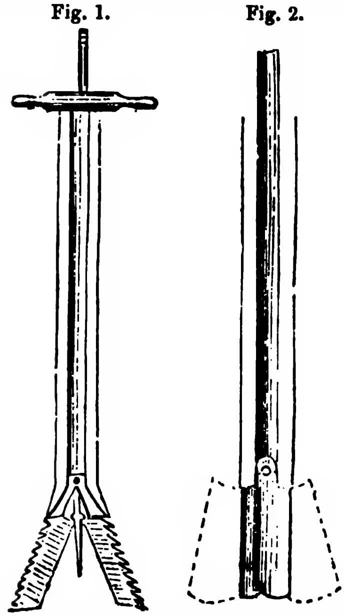
BY W. NISBET, ESQ., SURGEON, EGREMONT, CHESHIRE.

st of this paper is particularly
ation to some suggestions made
een years ago, and which are
ance. At that time I was soli-
gentleman interested in Welsh
to the subject of blasting rocks
nsideration, on account of the
cidents of life and limb to the
employed, and also the enor-
nse of tunnelling through hard
s I promised to do, on condition
d do the same. At the end of
friend produced a model, the
which consisted in the employ-
ing hammers attached to jump-
supported, and drawn back by
, or a spur wheel; a plan very
he one proposed by Mr. Nas-
mechanical section of the last
the British Association; but
as ever carried into successful
know not, as my friend shortly
e district. Meanwhile, three
uggested to my mind: one from
ey's submarine blasting by gal-
h he was then successfully con-
e Thames; another from Baron
s expanding forceps for seizing
bladder; and the third from the
ling-pieces invariably burst at
s being fired, when the mouth
gets plugged with earth or clay.
t be mentioned that I think the
ly putting a charge of powder
cannon of any size, especially
firing it after plugging the
wood, iron, mud, or soft clay,
an effective mode of destroying
rtillery, and the means are evi-
ready than those necessary for
king.

hing I proposed was to blast
instantaneously by the galvanic
ure a greater shock, which was
of; but as it has been since
d largely acted on, I shall say
er on this point.

the bottom of a bore is a great
as the smallest increase would
sist the explosion. The only
his direction, hitherto, seem to
but it is evident such means
blesome and tedious to manage,
licable to calcareous, or other
rocks. My first attempt was with
t (fig. 1) consisting of an iron
attached to it elastic steel ends with rough points, or saw-teeth on the out-side, readily movable for sharpening, which

Fig. 1. Fig. 2.



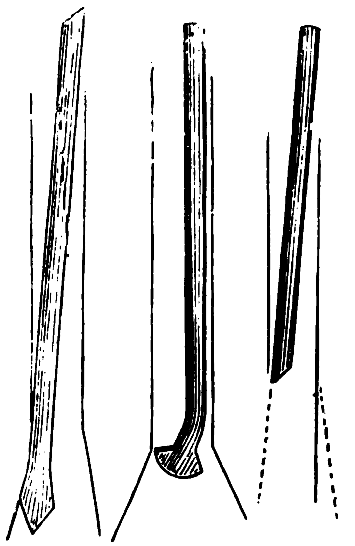
were to be expanded by a tapering rod passing through a solid bridge slightly notched, so as to widen like an inverted cone. The operation to be that of grinding, as it was turned round similar to a carpenter's auger, while the central rod was pressed down by the breast, or an assistant. This succeeds in hard clay, and also in soft stone, especially if wet, or with the assistance of water; but in hard rocks, where most needed, drilling will not do, from the points or teeth being quickly blunted and worn away;—it being the same whether the stone (as in the case of the grindstone) or the knife is moved. The idea, however, may be good for other purposes, as in iron or wood work—thus, recesses for oil might be formed at various distances where iron shafts are working in bored sheaths—and the outward surface of the expanding arms being formed into files or rasps, to act in any pattern.

For chipping—which is the only way of acting on hard rocks—several plans suggest themselves. One (fig. 2) consists in placing two short chisels, shaped like the claws of a surgeon's tooth instrument, opposite each other, on a strong nail as a hinge on the end of an iron bar, so that, when struck with a hammer, they will expand and cut side-

* of a paper read at the Literary
and Society of Liverpool, March 5,

ways. A second (fig. 3) consists in using a chisel or jumper of a smaller size for the

Fig. 3. Fig. 4. Fig. 5.



last foot or so of the bore, and giving it the play of the greater circumference above; and, according to the difference of size, will the inverted cone-width be obtained at the bottom. Thus, if a jumper of two inches be used for the first two feet, and then one of an inch only, driven angularly, at the end of another six inches the diameter of the bore would be increased to $2\frac{3}{8}$ths, and at three feet depth it would be $2\frac{5}{8}$th inches. This seems a very practical plan, and suitable for ordinary depths of two, three, or four feet bores. A third (fig. 4) is more suitable for great depths, and this is merely by setting a chisel of smaller size than the one used at first, and at an angle somewhere on the iron bar, and working part of the bottom of the bore with it, the principle and result being much the same as in the preceding case. And a fourth plan would be by using a chisel (fig. 5) with the cutting edge on one side, like a common joiner's chisel, and operating angularly on one side of the bore at a time, so as to widen down a portion of the sides to the bottom of a bore already made. One or other of such plans is surely practicable, more or less; for instead, as at present, of the diameter tending rather to diminish with depth, any increase at the bottom of a bore is a manifest advantage, by lessening the chance of cannons, and affording greater space for the blasting powder.

The paper being chiefly suggestive, I would beg to draw attention to a method of raising the *débris* of the bore by means of a syringe, instead of a scraper (which, I understand, is to be seen done successfully near Manchester), as I consider it applicable to any size of bores, whether wet or dry.

The third idea is connected with tamping, in which many experiments have been tried to find out the most safe and effective mode, the belief seeming invariable that the harder the grit employed, and the firmer the ramming, the greater will be the force of the explosion. To use the air itself has been entirely overlooked, unless as a small chamber over the gunpowder, which is spoken lightly of by Sir John Burgoyne in his treatise on Blasting Stone; and yet I believe the elastic resistance of a column of air—the deeper and narrower the more resistant—is far superior in power, safety, and simplicity to any solid tamping whatever. All that is necessary is just to cover the top of the bore with a soft lump of clay, and the effect is obtained, as is woefully experienced sometimes by careless sportsmen.

This latter suggestion is not one of theory only, as are some of the others; for I had the opportunity of proving it in the hard rocks near Newry, in Ireland, and the increase of the effect above that obtained by ordinary tamping astonished the workmen. It being about five years ago when the trial took place, I have expected to see the plan in general use by this time; and I can only account for its non-introduction from the circumstance of the men being opposed to the introduction of contrivances which tend to shorten labour, or from subsequent mismanagement. Some care is necessary to see that the clay is good, sufficient in quantity, and soft enough to fall over, so as at once and completely to close the small hole left by the match when it burns down and drops beneath, otherwise the blast is sure to cannon; and yet it must be so firm as not to get into the bore. In wide bores bits of wood might be placed across, so as to support the clay; but they should be embedded in it, as the smallest opening gives vent to the air. In my experiments a little loose grass was placed over the powder; but I consider anything unnecessary, and a portion of the slow-match falls upon it. My opinion is, nothing solid should be placed in the bore; but if further experiment indicates something over the powder, then a little grass, hay, wool, cotton, or such-like, would answer. If the bottom is conical, then I conceive an old piece of tin, or other substance, might be introduced to expand, like the Minie rifle-ball, so as to resist the blast as much as possible. I also suppose less powder necessary; but I leave such expe-

riments to those engaged in the business. I would only further remark, that it has always struck me that the blasting powder in common use is too large in grain, and low in power, and the present system altogether a matter of mere "rule of thumb," and not the most scientific nor the most profitable.

VENTILATION OF THE FIRE-ROOMS OF STEAM SHIPS.

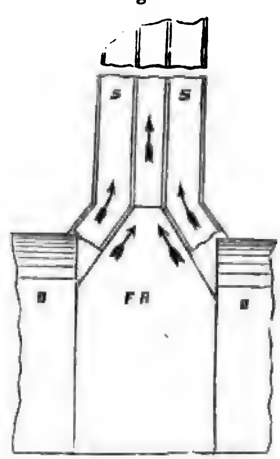
BY B. F. ISHERWOOD, CHIEF ENGINEER, UNITED STATES NAVY.

THE proper ventilation of the fire-rooms of large steam ships has become a matter of considerable importance, in view, not only of the comfort and health of firemen, coal-heavers, and engineers, but also of the efficiency of the boilers:—for, unless a rapid and free supply of cold air can be furnished to the furnaces, the consumption of fuel and the consequent production of steam will fall short of what it would be under that condition; and it is rare, indeed, to find a boiler producing the supply desired even under the most favourable circumstances. But it is chiefly for the purpose of diminishing the great heat of the fire-rooms of large steam ships, which, being situated in the bottom of the hold, are badly supplied with cold air, and the means of rapid exit for the air highly heated by the radiation from the boiler, that free ventilation is of the first consequence. None but those who have stood watches in the confined fire-rooms on the keelsons of our large men-of-war steam ships, can appreciate how intolerable is that heat, and how destructive it is to the physical energies and health of those subjected to it:—the heat in the fire-rooms of steam ships is what is called, "moist heat," and it is much more oppressive and difficult to be endured than the same degree of temperature of "dry heat."

While considering this subject of ventilation for the fire-rooms of steam ships, in the case where the boilers are set athwart ships, facing each other, and having the fire-room extending fore and aft the ship between them, as is now the general practice in all the new British steamers whose breadth of beam will admit the arrangement, and where the smoke chimney is placed over the centre of the fire-room,—it occurred to me, that by placing a pipe inner and concentric with the smoke pipe, open below to the fire-room and above to the atmosphere, as shown in fig. 1, in which B B are the boilers, F R is the fire-room, S S the smoke chimney, and A the air-pipe, the means would be provided at very little expense of money, materials, or space, for the rapid and free exit of the heated air of the fire-room. For the temperature and height of the surrounding smoke pipe would always cause a powerful ascensional column of air within the inner air pipe, and continuously deplete the fire-room with great rapidity. The supply of cold air should be furnished at the two ends of the fire-room, through a chute or box descending to within three or four feet of the fire-room floor, so as to insure delivery at or about the level of the ash-pits. With this system of ventilation a great decrease of the temperature of the fire-room would be obtained, together with the concomitant advantages of comfort, not only to the engineer force, but to the whole ship, and also a considerable increase in the steam producing power of the boiler.

It is evident, that with the general system, shown in fig. 1, a telescopic arrangement of chimney can be had by joining

Fig. 1.



the movable parts of the smoke and air pipes at their upper extremity alone, thus allowing the movable part of each pipe to descend within its corresponding lower or fixed part.

This system of ventilation can also be used in case of boilers extending fore and aft the ship, with the fire-room lying athwartship, when the smoke pipe is placed at the fire-room end of the boiler, as in single return tube and flue boilers, by curving the inner air pipe to an elbow and debouching it horizontally into the fire-room.

At first, it seemed difficult to arrange a damper in a smoke pipe containing an inner pipe; but a little reflection led me to the

system of damper, sketched in figs. 2, 3, and 4. In this system, the damper is divided into two parts, each part movable on its own axis, which axis passes close by the side of the inner pipe.

Fig 2 shows a cross section of the smoke and air pipes, and a top view of the dampers in a closed position; the black space indicate that portion of the cross area of the smoke pipe not covered by the dampers, for it is evident, that with this arrangement the entire area cannot be covered, the vacant spaces being the two segments of a circle having for arc a part of the periphery of the smoke pipe, and for chord, the straight line connecting the points where the axis of the dampers intersect the periphery of the smoke pipe. These small vacant spaces are practically no disadvantage, for the complete closing of a damper is never resorted to on account of the heat and coal gas it would force into the fire-room. The manner of moving both dampers, simultaneously, by one operation, is very simple, and so plainly shown, in figs. 3 and 4, as to require no detailed description. Fig. 3 shows the position of the links and hand rope when the dampers are closed. Fig. 4 shows the position of the same when the dampers are open. It will be observed that the axis divides the damper unequally, giving a larger area upon the outer than upon the inner side, which is required in order that the dampers may assume the vertical position when the hand rope is slackened.

Fig. 2.

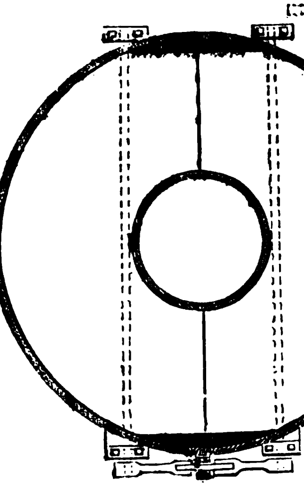


Fig. 3.

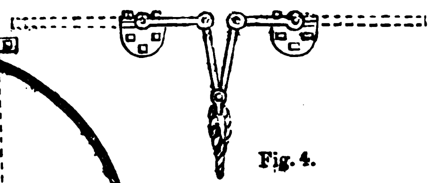
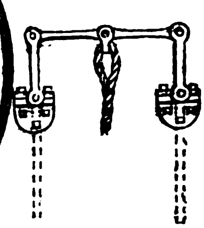


Fig. 4.



I am, however, of opinion, that ash-pit doors and not a damper in the chimney are the proper means of stopping the supply of air to the furnaces. The great recommendation of a chimney damper will be found in its convenience, for it allows the draft of all the furnaces to be stopped at once by one operation; while, on the contrary, if ash-pit doors are used, the closing of each door requires a separate operation, involving more time and trouble, not to mention the inconvenience of the doors themselves protruding into the fire-room. Nevertheless, ash-pit doors permanently hinged in pairs on the sides of the ash-pits, are doubtless the best mode of stopping the draft and quickly cooling the boiler; for while they entirely prevent the access of air below the grates and to the fuel, the furnace doors being opened, allow the ingress of a large body of cold air, which rushes in over the fuel, through the flues and up the chimney, thereby ventilating and cooling the fire-room also, instead of heating it, as the closing of a damper in the chimney would do, by throwing out into the fire-room the heat of the furnaces and the gases of the fuel.—*Journal of the Franklin Institute.*

COOPER'S PATENT DRAIN PIPES AND CONNECTIONS.

(Patent dated October 3, 1854.)

[T]HE great interest now taken in sanitary [ma]tters has led to the introduction of many [valua]ble improvements in various details [con]nected with this vitally important sub[jec]t. Many attempts have been made with [a vi]ew to increase the efficiency, to dimin[ish] the cost, or to facilitate the application [of] tubular drains.

Some important improvements in the [ma]nufacture, and in the mode of joining sewer and drain pipes, recently patented by Mr. Cooper, of Wootton Bridge, Isle of Wight, seem well calculated to realize each of the foregoing desiderata. The first object of this patentee has been directed to obviate the difficulties which attend the manufacture and use of earthen pipes of large dimensions, and especially to facilitate the laying down of large pipes in deep drains and other places of difficult access.

Fig. 1.

Fig. 2.

The second improvement consists of a simple and convenient mode of joining drain pipes of smaller dimensions, both of which will be easily understood by the following extract from the patentee's specification.

"The improvement in the manufacture of earthen drain pipes consists in moulding them in two halves, having alternate projections and depressions on their edges, which, when the two halves are brought together, interlock and unite them, thus forming a complete pipe. Fig. 1* shows a portion of a completed earthen sewer pipe, constructed agreeably to the first part of my invention, being composed of a series of upper and lower halves, formed by moulding in suitable dies. In laying down these drain pipes the upper and lower halves are so arranged lengthwise as to break joint, as shown in the drawing, half lengths being used for completing the end of the pipe; a small portion of cement makes the joints perfect, and a flush waterway is preserved throughout.

"The improvement in the mode of joining earthen pipes consists in forming short lengths of suitable dimensions in two halves, with alternate projections and depressions in their edges; two of these pieces being put together around the ends of two cylindrical pipes, with a suitable cement, firmly joins them together. Fig. 2 shows a portion of a drain, composed of cylindrical pipes united by connecting pieces. The lower half of the connecting piece, being laid down first, and some cement nicely bedded, the ends of two pipes are brought together and laid therein; the saddle, or upper half of the connecting piece, is then cemented on, and a perfectly flush joint is produced. The pipes are glazed, but it is preferred that the connecting pieces should be left unglazed, to enable the cement to take a firmer hold. Tees, crosses, or bends of any required curvature can readily be introduced wherever they may be required."

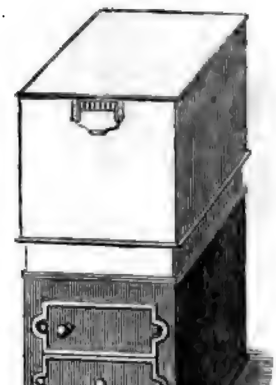
WILLIAMS' CAMP STOVES AND COOKING APPARATUS.

Mr. J. O. Williams, of Torquay, has recently obtained Provisional Protection for a most ingenious arrangement of apparatus which comprises a portable stove and such culinary utensils as are necessary to form a complete set of kitchen articles all stowable in a small compass.

The fire-place is formed of plates of iron, the sides and ends being combined in the form of an oblong figure, at one end of which is a door, and at the other an aperture to which a flue is fitted. A grating rests upon lugs provided for the purpose on the inside of the fire-place, the whole of it being used when wood is the fuel employed; but when coal or charcoal is used, so large an amount of grating surface is not necessary, and an iron box or stopping-plate is then fitted so as to cover a portion of the grating. The top of the fire-place is open, but in order to prevent the escape of smoke, except through the flue, a groove or channel is formed upon the top of the plates forming the fire-place, for the reception of sand or other similar material, into which groove a rim on the underside of the pots or pans fits so as to form a perfectly tight joint. On the outside of the end-plate to which the flue is fitted three plates of metal are fixed over the top and at the two sides of the aperture, in such manner as to leave space between these plates and the back of the fire-place plate. A flange or rim is turned up on the four sides of the metal pipe forming the flue, and the upper and two side flanges slide into the space just mentioned; the flue being securely attached to the fire-place, by passing a rod through eyes along the whole length of the bottom flange and under side of the flue. The flue may be carried to any required length and in any direction, by means of elbows.

Fig. 1 of the accompanying engravings represents the apparatus stowed for carriage. The same external appearance as that shown

Fig. 1.



in this figure is preserved when, for baking purposes, a plate with rims on the underside of it fitting into the sand channel is placed over the fire-place, and covered by a pan or cover provided with suitable apertures to allow the steam which is formed to pass off.

* See preceding page.

Fig. 2 represents the furnace surmounted by a boiler, which also is furnished with rims fitting into the sand joint, and which has above it a steaming vessel. Several of these vessels are provided, placed within each other when stowed for carriage, and in order to cause them to fit tightly over each other when required for steaming, the inventor supplies a flanged rim which fits on the top of each successive vessel, and forms a support for the one next above it.

Fig. 2.

Fig. 3 represents the boiler mounted on a frame furnished with legs. In this figure an arrangement of the apparatus is shown, in which three heating vessels are simultaneously in use, one for coffee, a second for water, eggs, &c., and a third to supply the place of a stew pan. The handles of these vessels are so constructed that they may be folded over when not in use, and thus made to occupy but little space.

Fig. 4 represents the furnace mounted, as in fig. 3, and surmounted by a kettle furnished with rims which enter the sand channel, as has already been explained. All the boilers fit into each other, and the kettle may be placed above them. There is in the apparatus a poker and shovel, together with knives, forks, spoons, plates, &c. It is evident from the foregoing description, that Mr. Williams' arrangement is remarkable for compactness, utility, and economy.

Fig. 3.

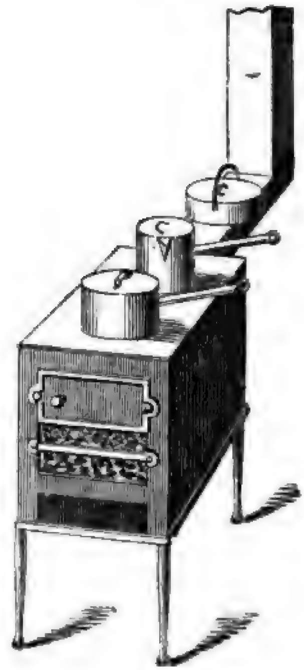
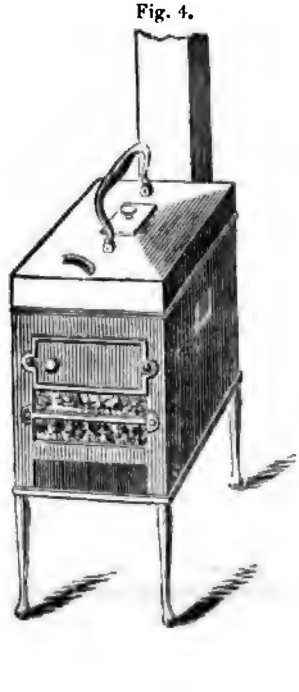


Fig. 4.



ERRORS OF MECHANICAL ENGINEERS.

THE *Journal of the Franklin Institute* for March, 1855, contains an article by Mr. Truran, to which great prominence is given, on "Errors committed by Writers on Mechanical Engineering." After briefly alluding to the recent progress of engineering, and expressing his regret that in many instances false theories have been laid down by writers on mechanical and engineering science, the writer announces his intention of discussing some of the most obvious and common errors which are to be met with in publications intended for the especial use of theoretical and practical engineers. He then proceeds thus: "We will begin with one which is found in nearly every text-book on Mechanics, and which seems to have originally emanated from a celebrated French philosopher:

'*Two men working at a windlass with handles at right angles, can raise 70 pounds more easily than one can raise 30 pounds.*'

'*Desaguliers.*'

On an attentive consideration, the incorrectness of this statement will be evident to the student. If one man is capable of raising 30 pounds only, two men will raise twice this weight, or 60 pounds, and not 70 pounds, as Desaguliers asserts. If we deny the correctness of this dictum, we must be prepared to show the source from whence any additional power over the 60 pounds is obtained. This we are unable to do satisfactorily. Were we to admit that a gain of power resulted when two men were at work, we must also allow, that with an increased number of men, the gain of power will be correspondingly great."

The reasoning here pursued by Mr. Truran has so little to do with the assertion of Desaguliers, that it scarcely deserves notice. We may, however, remark in the first place, that Desaguliers *does not* assert that if one man is capable of raising 30 pounds *only*, two men will raise 70 pounds. What he states is, that if one man working at one handle of a windlass can raise 30 pounds *with a certain degree of ease*, then two men working with handles at right angles can raise 70 pounds *with a greater degree of ease.* We do not at this moment purpose to contend that this somewhat loose statement is true, but rather to prove that Mr. Truran's remarks are worthless. And this we will do by showing that it is quite possible for two men, by means of a windlass with two handles placed at an angle to each other, to raise a greater weight than double that which one alone could elevate. For it is evident, as Mr. Truran himself shows *farther on* in his paper, that the force which a man is able to exert upon the handle of a windlass varies with the different positions of the handle, and at certain points attains its maximum and minimum; and it is equally clear that the greatest weight which he can raise by means of the windlass is determined by the minimum, so that if at one point of the handle's path he can exert a pressure of no more than 30 lbs., then 30 lbs. is the greatest weight which he can raise; and if another man (of equal strength, as must be assumed) be set to work upon the same handle, the two will be able to raise no greater weight than 60 lbs., while if the second man be applied to a handle placed at such an inclination to the former that when the first is exerting 30 lbs. pressure he is exerting 40, it is plain that the two together will in that case be capable of raising a weight of 70 lbs. To the last clause of the paragraph quoted from Mr. Truran's paper we of course assent, and willingly allow "that with an increased number of men, the gain of power will be correspondingly great," as that gentleman may ascertain by applying to any of those obliging and communicative individuals who, either in America or in this country, devote their energies to the elevation of bales, the dredging of mud, or any similar occupation.

We may remark, in the second place, that although we think it an unwise thing to specify definite numbers arbitrarily in cases where proportions cannot be determined, as Desaguliers does, still we are quite sure that it is possible for his statement to be literally true. As we are confident our readers need no proofs that it is so, and as we are on that account anxious to set Mr. Truran right as briefly as possible, we recommend him to furnish himself with a friend of equal strength with himself, and a windlass or crane with a very long handle, so that he shall be thrown into inconvenient postures in turning it, and be able to exert but a small force in some positions—say when the handle is moving through the upper arc of its path, at such a height above his head that he can but just grasp it—and, after elevating for some distance as great a weight as he can possibly raise with this arrangement, let him add to that weight an additional one, one-third greater than it, and apply his friend to a second handle, similar, but at right angles to the first, and we are confident he will find himself labouring "more easily" under the new than under the old conditions.

We should not, however, have noticed Mr. Truran's paper, had not the following formed part of it: "That this common mistake regarding the extra power got by setting the handles at right angles is not confined to a few persons, but is believed in

by some of the ablest writers, we will endeavour to show, by making an extract from a letter, written by Mr. J. C. Robertson, C.E., and for nearly thirty years editor of the London *Mechanics' Magazine*, to a private correspondent, dated March, 1849: 'The force of two men rightly applied to a crank, is more than twice one in the proportion of 70 to 60.'

"When the editor of the London *Mechanics' Magazine*, a civil engineer, and one of the ablest writers on mechanics and mathematics of the day, believes in such gain of power, we may well excuse a similar mistake in less able men. But with all due deference to Mr. Robertson's abilities as a writer and mathematician, we must doubt his obtaining from two men more than twice the power of one."

The same confusion and misapprehension is visible in this as in the former criticism of Mr. Truran. Allowing for the laxity which even editors sometimes exhibit in *private* correspondence, the statement of our predecessor is undoubtedly true, although it would have been better had he avoided the mention of a given proportion. And we protest against the false and unfair insinuation respecting "his obtaining from two men more than twice the power of one," because the "power of one," in common language, signifies the limit of the power which one can exert without regard to the mode in which it is applied, while his statement was to the effect that from two men, "rightly applied," a greater result may be obtained than from the same two wrongly applied.

We may, in conclusion, remark that the *Franklin Journal*, which is usually conducted with much ability and perfect honour (contrasting in both respects with some of its transatlantic contemporaries, as our readers will remember), scarcely maintains its character, we think, by placing such an article as that we have mentioned in the prominent position it occupies; and our readers, we are sure, will think with us, when we inform them that Mr. Truran is unable to account for the number of steam engines in Europe having two cylinders with their cranks at right angles, on no other supposition than that "practical engineers have reasoned that if there is a gain of power by disposing the handles of a windlass at right angles, a similar disposition of the cranks driven by steam, water, or other inanimate power, would be attended with like advantages, and have constructed their engines and machines with such cranks, in the full belief that a positive gain of power is thereby obtained."

REMARKS ON MAGNETISM BY PROFESSOR FARADAY.

In a letter addressed to Professor Tyndall, and published in the *Philosophical Magazine* for April, Professor Faraday says:

"In relation to your letter of last month,* I write, not for the purpose of giving what might be taken as an answer, but to say that it seems to me expedient and proper to wait and allow the thoughts that my papers may raise, to be considered and judged of at their leisure by those who are inclined to review and advance the subject. Perhaps, after a respectful interval, I may be induced to put forth such explanations, acknowledgments, or conclusions, as the state of the subject may then seem to render necessary or useful.

"In the mean time, the more we can enlarge the number of anomalous facts and consequences, the better it will be for the subject; for they can only remain anomalous to us whilst we continue in error.

* * * * *

"You are aware (and I hope others will remember) that I give the lines of force† only as *representations* of the magnetic power, and do not profess to say to what physical idea they may hereafter point, or into what they will resolve themselves. Advancing no principle, I say, that the hypothetical fundamental ideas already advanced, when taken in relation to the body of facts now known, are self-contradictory and inapplicable. The following points, namely,—that the *direction* and *polarity* of lines of magnetic force are always shown truly by the electric current induced in metal moving within their influence;—that the dualities of electricity and magnetism are always respectively and essentially related;—that the dualities of an isolated magnet are not related back in straight lines through the magnet; are to my mind not hypothetical in character, but easily proveable by experiment:—and they, with the considerations arising from the principle of the conservation of force, seem to me to be left unexplained by, and in opposition to, the usual hypotheses. No difference arises about the laws of magnetic action and their mathematical development; and that, simply because they are as yet applied only partially, and thus far are in accordance with *all* the views taken, including mine. When the attempt is made to apply them so as to include at once *para-magnetic*, *dia-magnetic*, and *electro-magnetic* phenomena, and at the same time

* *Phil. Mag.* 1835, vol. ix. p. 205.

† It is nearly twenty-four years since I first called attention to these lines; Exp. Res. 114, note.

to deduce them from *one* hypothetical cause, then they may become so large and yet precise as to enable us to distinguish between true and false assumptions. On my part, I endeavour not to assume anything, but only to draw such conclusions from the assumptions already made, and the phenomena now discovered, as seem subject to experiment and tangible by facts.

"Some persons may feel surprised that I dwell upon points which are perfectly and mathematically explained by the hypothesis of two magnetic fluids, as, for instance, places of little or no action. My reason is, that being satisfied by the phenomena of dia-magnetism, &c., that that hypothesis cannot be true, all these and such like phenomena acquire a new character and a high importance which they had not before, and amongst other philosophical uses, point most emphatically to the essential relation of the dualities and their equivalency in power. They do not contradict the old hypothesis when that is partially applied, but they are not the less strong and striking as evidence in favour of the view of lines of force."

NORTH OF ENGLAND COAL MINES.

In a lecture on "the mining districts of the North of England," recently delivered by T. Sopwith, Esq., F.R.S., at the Royal Institution, it was stated that the production of the coal mines of the Northumberland and Durham district now reaches an amount little, if any, short of fourteen millions tons annually. In round numbers, and as conveying a general approximation, it may be considered, that of this quantity six millions are destined for London and the coast trade, and about two and a half millions exported abroad; the consumption of coal for coke (inland, coast, and foreign) is about two and a half millions; colliery engines and workmen consume upwards of a million tons; and the ordinary local consumption of the district may be taken at about two millions. Of this enormous quantity, a conception can only be formed by reducing it to some other standards of comparison, as for example:—This quantity of coal, if formed into blocks of one cubic yard each, would cover about four square miles; and if the same quantity of coal be considered as forming the coating of a road, one inch thick and six yards wide, it would extend considerably more than four thousand miles. Blocks of one cubic foot can be readily comprehended; and if one person were employed to count these blocks at the rate of three thousand six hundred in every hour, and thirty-six thousand every day, it would occupy him more than ten years to complete his task.

ON STEAM USED EXPANSIVELY.

To the Editor of the Mechanics' Magazine.

Sir,—When a voice has been long crying unreturned in a sleeping wilderness it is both pleasing and startling to hear the sound of the first awakening echo, especially if the echo be of fulness and power. For some years I have publicly and perseveringly insisted on the necessity of preparing to adapt a high degree of pressure to marine engines. It is therefore not a little gratifying to see such an authority as Mr. Fairbairn join in argument, in his late lectures, and tell the engineering world they must look forward and prepare for an accession, and not a reduction in the working pressure of this great agent. My advice has hitherto been almost as unnoticed as that cry "in the streets which no man regardeth," hardly any one of note having ventured to attempt my refutation. Two acute neighbours, indeed, of Mr. Fairbairn, Mr. Spence, of Pendleton, and Mr. Nasmyth, undertook to show that high pressure and expansion were a delusion and a snare; the latter urged that we must go backwards in pressure, and the former especially endeavoured to prove that my calculations were erroneous; but they soon seceded from the field and left me "alone in my glory." I was content to begin with the active recommendation of 100 lbs. per inch, very confident that, perhaps before this century closes, 200 lbs. to 300 lbs. will be commonly used at sea. It is about four years since that Mr. Fairbairn was advocating 50 lbs., and it is therefore very interesting to see him now tripling his estimate, advancing beyond myself, and urging 150 lbs. fearless of prejudice.

Those who have studied the subject of expansion know that at every doubling of the volume of an elastic fluid 75 per cent. is added to the mechanical effect which that fluid would exert if used without expansion. Thus the steam which Mr. Fairbairn proposes to generate at 150 lbs., would, by the time it had expanded down to 9 lbs. previous to condensation, have exerted a mechanical force 3¼ lbs. more than if generated merely at the 9 lbs., and passed directly to the cylinder of a common condensing engine. And not only, as Mr. Fairbairn states, there is no more fuel required to generate the steam under the pressure which produces this enormous gain of power, but the effect is actually still higher in proportion to a given quantity of coal. All elastic fluids dilate in bulk about

$\frac{1}{500}$th part for each degree of increase in temperature, and steam at 150 lbs. being nearly 200° hotter than steam at 9 lbs., there is a further gain in the volume of the steam so generated, which raises the whole mechanical effect of a given weight of steam, successively expanded from 150 lbs. to 9 lbs., to nearly six times more than could be obtained out of that weight of steam if simply generated and used at the lower pressure without expansion. This is not the age to propose ethical discussions on the supreme good, and debate whether Arcadian ignorance and simplicity or active mechanical intelligence contribute most to universal happiness. The second phase is the fact; we are entirely plunged in a mechanical existence; whole nations go on wheels, or are driven by propellers; the flocks and herds of the patriarchal state are substituted by another wealth; we count our cattle, not by horns, but by horse power, and his quiver is most full of arrows who can feed the most horse powers upon the same ration of coal. These are the realities to be grappled in our social progress, and Mr. Fairbairn takes a post worthy his reputation in heading an economical movement, which will ultimately render every pound of coal consumed in ocean steamers of ten times its present productive value.

Let us look round and see what Watt has done, and reflect what will be created when we do ten times as much with the same means. Of course the engines which Mr. Fairbairn is using his influence to introduce at the Admiralty, are that perfect development of the expansive system, now at work for years in various parts of the kingdom, where the supply of water required is but one gallon per day per horse power, where the steam is generated in boilers which make the dangers of explosion a thing of the past, and where the whole machinery per horse power for boiler and engine is but one-fourth of what are now afloat, with a proportionate diminution in the consumption, and consequently of the stowage space of the coal. Let any man estimate for himself the millions and tens of millions which would be saved in half a dozen years by such a change. It is these machines of course which Mr. Fairbairn has in view, saving, as they do, 80 per cent. of the fuel of the ordinary locomotive. The locomotive boiler is probably introduced into the lecture by way of comparison, to illustrate the effect; there can be no intention of introducing its tens of thousands of tons of destructive effect, in the event of explosion, into the bosom of ships in the middle of the sea. The occasional blowing to pieces of a railway station is already a sufficient calamity. Besides, these locomotive cattle are very particular in their drink, and very thirsty; and to confine such hard drinkers to the brine of the great deep would be a cruelty unsuited to their healthy constitution. When the engines to which I refer were first constructed, comparatively little was practically known out of Cornwall of the economy of expansion; even so late as the Great Exhibition, engines, both foreign and native, arranged to combine high pressure, expansion, and condensation were not appreciated; we must therefore hail it as an era of great progress, when our foremost engineer is lecturing that their economical action is acknowledged, and is using his efforts to introduce them to our ships of war.

It is personally gratifying to find the theory I have so assiduously laboured being carried forward by such eminent practical hands. When one of such station takes the crest of the wave, there is no danger of his ignoring the earlier influences which set the swell, on which he rides, in motion. In writing history we do not say merely that a battle was won in such a year, without naming either the place or the actors who were engaged in it. My own part has been but little; I have puffed some feeble breath to aid the expansive current which, it seems, is flowing in. It will eventually prove the great fact of our age. Old Hobson's trade is promoted; we are all become carriers either by sea or land, and notwithstanding the exhibition in the Crimea, where even this antiquated being would have been a Godsend, there is no question that speed, security, and cheapness of transport, and the means which will best combine them, form now the problem of first importance to either the statesman or the economist. When Lord Derby engaged to eat the boiler of the first steam ship which crossed the Atlantic, he little knew what he undertook; yet much as has since been done, multitudes have hitherto formed no better conception of what is ready prepared and in the power of an equally short future to accomplish.

I am, Sir, yours, &c.,

DAVID MUSHET.

April 9, 1855.

ON THE INDICATED HORSE-POWER OF STEAM-ENGINES.

To the Editor of the Mechanics' Magazine.

SIR,—I am charged by "Ingénieur," in his last letter, with possessing a knack of avoiding the real question in dispute.

Now, Sir, let us see in his own words what the real question in dispute really is. In his first letter, on page 157 of your number of February 17th, he begs to be "permitted to call your attention and that of your readers to a very singular error that

exists in the calculation of the horse-power from diagrams obtained by a McNaught indicator." In his second letter, on page 254 of your Magazine of the 17th of March, he says, "My reason for condemning the present method of calculating diagrams, as given in my letter, published in your last number of the 17th of February, is briefly that since the velocity of the piston is continually varying throughout the stroke, and since the pressure upon the piston also varies (in an infinite variety of ways in different engines), it is impossible, except by the merest chance, to obtain a correct result by averaging both the pressure and velocity." In the last paragraph of his first letter, he suggests this continual varying of pressure and velocity while the piston of the engine is moving from top to bottom and from bottom to top, as being "no doubt the cause of a part of that discrepancy that is found to exist between the actual and indicated horse-power of engines working expansively"!!

Now, that an actual discrepancy does exist between the actual and indicated horse-power of engines working expansively (over and above what is found in engines working unexpansively), I do not dispute, but that this excess of discrepancy *is in the least due to the continual varying of pressure and velocity while the piston of the engine is moving from top to bottom and from bottom to top, I entirely deny.*

In the method of calculating the horse-power of steam engines, given in the second paragraph of my first letter, on page 228 of your Magazine of the 10th of March, "Ingénieur" will find, that to find the space the piston of the engine passes through per minute, there is no averaging of the different velocities of the piston. Nor, Sir, is it necessary to do so; and no individual in the least acquainted with the "*principle of work*" will contend that it is. The space, in feet, the piston passes through per minute, is simply the length in feet of the stroke multiplied the number of strokes.

If "Ingénieur" had only paid a little more attention to the nature of an indicator diagram, as described in the second paragraph of my first letter, he would have noticed that the area of an indicator diagram is simply made up of an infinite number of ordinates, which represent the pressure of the steam at an infinite number of particular portions of the stroke of the engine, and in order to find the average length of this infinite number, it would be necessary to divide the aggregate of these lines by infinity. This being the case, that the area of an indicator diagram is made up entirely *of pressure*, and not being made up in the *least of the time* during which the diagram was formed, nor being in the least made up of space through which the piston of the engine passes in that time, it is utterly impossible to measure velocity by striking off a quadrant, however divided at each end of the atmospheric line. And further, from what is laid down in the former part of the second paragraph of my first letter, the inference which is drawn at the latter end of the said paragraph is a "logical" one.

I shall only just remark, in conclusion, that the three letters of my opponent are anything but a credit to the scientific knowledge which it is necessary he should possess to be deserving of his title, "INGÉNIEUR."

I am, Sir, yours, &c.,

JAMES EMMETT.

Burnley, April 17, 1855.

ON POLYCHROMATIC PRESSES.

To the Editor of the Mechanics' Magazine.

SIR,—I noticed in your last number a communication, signed "J. G.," giving a description of "a polychromatic printing-press," which is therein spoken of as "a new American invention." Being somewhat acquainted with colour printing machinery, I can safely assert that, so far as results are described, there is nothing new or original about it. In corroboration of this, I would refer those who may feel interested in the matter to the title-page of the *Mechanics' Magazine*, vol. i., and to the pages of the *Illustrated Historic Times*, 1849-50, where will be found specimens of colour printing more than agreeing with the results claimed by "J. G." as peculiar to this "new American invention." So far as I can judge from the description given, it is identical with either "Congreve's compound colour-printing machine, or one which was used for some time, I think at Doudney's." Congreve's is worked by steam, and therefore can produce a much larger number than that calculated upon by "J. G.," as the results of the one he describes.

It should, however, be known, that there is a most important disadvantage in all these machines, rendering them altogether useless for that class of work, which constitutes at least three-fourths of colour printing. They will all print colours side by side, "even to the shading of a letter;" but they cannot, by any possibility, print them *one over the other*, which is absolutely necessary to obtain that graduation of shade, variety of tint, and general effect which is indispensable to all but the commonest of work.

The machine of Charles Knight accomplishes all this, but it can only print one set

of blocks or colour at each operation. The "Polytint printing-machine," invented and patented by myself (see *Mechanics' Magazine* for February 25th, 1854), is the first and only machine which combines all that is essential for the execution of all kinds of work. Apologising for thus trespassing on your pages, I am, Sir, yours, &c.,

HENRY C. GOVER.

Princes-street, Bedford-row.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

CLARK, FREDERICK, of King-street, Westminster, Middlesex, turner. *An improved spindle and bush for door-knobs, and other similar uses.* Patent dated September 28, 1854. (No. 2080.)

In carrying out this invention, the spindle for the door-knob has at one or at each end a thread which, upon the spindle being passed through the door, may be screwed into a corresponding thread formed in a collar for the spindle which turns in a bush or socket secured to the knob or handle, and moving with it.

ROGERSON, JOHN, and JAMES BRIMELOW, of Bolton, Lancaster, engineers. *Improvements in certain parts of steam engines.* Patent dated September 28, 1854. (No. 2082.)

This invention consists—1. In connecting with the slide valve a piston with a dome so formed as to permit of the employment of a long connecting rod. 2. In surrounding the piston with a steam-tight casing, for the purpose of preventing the exit of the steam or condensed water, except through a tap provided for the purpose. 3. In the application of weighted levers, either simple or compound, for the purpose of more accurately adjusting the counteracting force.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improvement in the rigging of sailing vessels.* (A communication.) Patent dated September 28, 1854. (No. 2084.)

This invention relates to a mode of applying a second or extra topsail-yard to the cap of the lower mast-head, and also a crane or brace to the heel of the topmast-top or trestle-trees to the lower mast, the object being to lower down the upper topsail-yard into close proximity with the second or extra yard.

JOHNSON, WILLIAM BECKETT, of Manchester, Lancaster, engineer. *Improvements in lamps and other apparatus used for illumination.* Patent dated September 28, 1854. (No. 2086.)

Claim.—So adapting the glass or glasses of lamps or other apparatus for illumination, that they may be raised without being removed from the parts which support them, in order to expose the wick or other illuminating medium.

CRUX, GEORGE, of Manchester, Lancaster, laceman. *Improvements in the production of bonnets, children's hats, and similar coverings for the head.* Patent dated September 28, 1854. (No. 2087.)

This invention relates to bonnets, &c. made of woven fabrics, and consists, firstly, in producing the outline of the article during the production of the fabric; and, secondly, in a method of producing devices upon such fabrics.

LANCASTER, CHARLES WILLIAM, of New Bond-street, Middlesex, gun manufacturer. *Improvements in fire-arms and in cartridges to be used therewith.* Patent dated September 28, 1854. (No. 2089.)

The improvements in fire-arms consist in the construction of a breech-loading gun discharged by an ordinary lock and percussion cap, the aperture of the barrel being closed by a breech swivelled on to a closing bolt. The improved cartridge to be employed with the improved arms consists of a shell of pulp or paper, into the bottom of which a concave perforated wad is inserted in order to strengthen the base of the cartridge, for the purpose of removing the remains of the cartridge after discharge. Fire is communicated to the powder in the cartridge from a percussion cap through an aperture in the wad. The invention also consists in a means of converting breech-loading into muzzle-loading guns by inserting at the breech end of the barrel a compound wad or disc composed of a combination of a hard and a soft metal.

POOLE, MOSES, of Avenue-road, Regent's-park, Middlesex. *Improvements in cylinder paper machines.* (A communication.) Patent dated September 28, 1854. (No. 2090.)

This invention relates to those paper machines in which a cylinder or drum, covered with wire-cloth, and revolving partially immersed in a vat of pulp is employed, and the improvements consist in communicating to the cylinders of such machines a vibratory as well as a rotatory motion, or in producing in the pulp currents across the direction in which the surface of the cylinder travels.

GRIFFITHS, THOMAS FOXALL, of Birmingham, Warwick, manufacturer. *An improvement or improvements in lamps.* Patent dated September 29, 1854. (No. 2092.)

Claim.—Raising and lowering such lamp-wicks as are flat by the use of a pinion of a length equal, or nearly equal, to the breadth of the wicks.

MOHAN, THOMAS, of Aclint, Louth, farmer. *An improved churn.* Patent dated September 29, 1854. (No. 2093.)

The inventor employs a peculiar dasher or agitator, which is composed of a perpendicular shaft set round with fans or blades forming part of a spiral thread, a portion of the thread equal in size to one blade being cut away between every two successive blades. The latter increase in width towards their outer extremity.

SHEATH, WALTER, of Derby-road, Nottingham, mechanic. *An improvement in sewing machines.* Patent dated September 29, 1854. (No. 2094.)

This invention consists in the employment in a sewing machine of a single needle carrying a single thread in an eye near its point, which needle is inserted about half its length into the material to be sewn, and when it recedes to make another stitch, forms a loop which is held by a catch until the needle returns and the stitch is completed.

GAMEWELL, JOHN NELSON, of Camden, Kershaw district, South Carolina, United States. *Improvements in instruments for relieving the wires of the electric telegraph of atmospheric electricity.* Patent dated September 29, 1854. (No. 2095.)

The inventor states that his improvements depend on the fact that atmospheric electricity, unlike galvanic, will leap from point to point of several conductors, and he therefore employs metallic points, which are in intimate connection with, and form part of the main line of wire, and lead close to (without touching) other metallic points which communicate with the ground, and are surrounded by air kept constantly moistened by evaporation from a trough, or other equivalent means.

FILHON, GÉMIS, of Paris, gentleman. *Improvements in glass chimneys for gas-burners or lamps.* Patent dated September 30, 1854. (No. 2100.)

The inventor makes glass chimneys in the form of inverted truncated cones, which expand at the upper parts into bell-mouthed forms, sometimes contracting the chimney above the expanded part so as to form a sort of reservoir.

COLLINS, THOMAS, of Gayton, Northampton, brick-maker. *Improvements in manufacturing bricks and tiles.* Patent dated September 30, 1854. (No. 2101.)

Claim.—"Manufacturing bricks and tiles by rendering available the heat from the kilns employed in such manufacture, and employing such heat for effecting the drying of the moist moulded clay in the drying-sheds during the burning of the clay which is in the kilns, thereby dispensing with the necessity for employing separate fires in the drying-sheds."

BOYLE, ARTHUR, of Birmingham, Warwick, tool-maker. *Improvements in umbrella and parasol-stretchers.* Patent dated September 30, 1854. (No. 2102.)

The inventor constructs machinery so arranged that by the rotation of an axis with cams and connecting parts, tools similar to those heretofore used are worked, and the wire is moved to and operated on by the tools in succession, in such manner that the wire is fed in at one part of the machine, and delivered at another formed into stretchers.

POOLE, MOSES, of the Avenue-road, Middlesex. *Improvements in condensers.* (A communication.) Patent dated September 30, 1854. (No. 2103.)

This invention consists in so arranging the tubes in tubular condensers that each may expand independently of the others, by causing them at one or both ends to pass through a packing formed of a sheet of vulcanized India-rubber or other suitable material, which is supported by collars formed on the tubes, and is kept in place by plates of metal pressed thereon by screws or other suitable apparatus.

WILSON, GEORGE FERGUSSON, of Belmont, Vauxhall, managing director of Price's Patent Candle Company, and GEORGE PAYNE, of the same place. *Improvements in the manufacture and application of rosin-oil.* Patent dated September 30, 1854. (No. 2104.)

The inventors say, "by distilling rosin-oil with the air excluded by preference by means of an atmosphere of steam, and then treating it with sulphuric acid, and subjecting it to further distillation with the air excluded by preference in an atmosphere of steam, and by treating rosin-oil with sulphuric acid, subjecting it to distillation with the air excluded by preference by steam, products valuable for lighting, lubricating, or use in soap-making are obtained."

COOK, WILLIAM WOODS, of Rumforth, near Bolton, Lancaster, muslin manufacturer. *An improved method of weaving or manufacturing woven fabrics suitable for petticoating, or similar purposes, where thick and thin parts of the same fabric are required.* Patent dated October 2, 1854. (No. 2108.)

This invention "relates to an improved method of weaving two bodies of corded cloth at the same time, connected only at the selvages, and so arranged that the thick or corded part of the face cloth shall not be woven opposite the thick or corded part of the back cloth."

SHERRIFF, THOMAS, of Glasgow, Lanark, engineer. *Improvements in moulding or shaping metals.* Patent dated October 2, 1854. (No. 2109.)

This invention relates to the construction of sand or loam moulds for casting metallic pipes or other articles of cylindrical trans-

verse section, and consists in forming the mould gradually from the bottom upwards, by means of two or more rollers or pulleys which are made to run round and press or roll down the sand or loam in continuous thin layers, these rollers being carried by a lantern or frame which is made to rotate by a central shaft upon which it rises as the mould is being formed. The inner cylindrical surface of the mould is shaped by a short cylindrical pattern (its upper surface being conical) which rises with the lantern and rollers as the mould is formed.

PENN, JOHN, of Greenwich, Kent, engineer. *An improvement in the bearings and bushes for the shafts of screw and submerged propellers.* Patent dated October 2, 1854. (No. 2114.)

This invention was described on page 342 of our last number.

HILL, CHRISTOPHER, of Chippenham, Wilts. *Improvements in the manufacture of pulp.* Patent dated October, 2, 1854. (No. 2115.)

In carrying out this invention the vegetable matters employed are first subjected to the action of pulping machinery, and the pulp thus obtained from the crude vegetable matters is then boiled with a caustic alkali, and afterwards bleached.

HAMMOND, JAMES, of Brunswick-street, Blackfriars-road, Surrey, chemist. *Holding a book in such a position that it may be read with ease and comfort in an erect, reclining, or completely recumbent position, to be called "Hammond's suspension reading-desk."* Patent dated October 3, 1854. (No. 2117.)

The inventor constructs a frame suitable for holding a book open, and suspends it in such manner that the height and inclination of it may be regulated.

TATHAM, WILLIAM, of Rochdale, Lancaster, machine-maker. *Improvements in machinery or apparatus for preparing, spinning, doubling, twisting, and winding cotton, wool, flax, silk, and other fibrous substances.* Patent dated October 3, 1854. (No. 2118.)

This invention consists—1. In the application to the devil or teasing machine of a number of wooden lags or metallic plates, with numerous spikes or projecting points on their surfaces, to assist the main teasing portion of the machine, and to break, clean, or separate the fibrous material as it passes through it. 2. In the application to the card-box rollers of the carding engine—to the rollers of the coiler or can-filling apparatus—and to the rollers of the drawing, slubbing and roving frames, of a tube, funnel, or similar apparatus furnished with a yielding plate or spring to give way when any uneven yarn or thread is passing through, and thus to prevent breakages. 3. The construction of certain spindles and flyers. 4. A certain arrangement of toothed gearing for driving the flyers, &c. 5. The application of pegs and corresponding recesses to bobbins or bobbin-wheels to prevent the bobbins from leaving the wheels during the filling or copping. 6. In the application to the said machines of flyer-tops constructed with slits in them, for the purpose of conveying the fibrous material more easily down the flyer-top to the leg of the flyer when piecing the end up. 7. In the application to throstle frames, doubling, twisting, or winding machines, of a peculiar arrangement and construction of spindles and flyers and certain machinery or apparatus connected therewith; also of a peculiar mode of supporting and steadying them by means of rails or tubes.

BLYTHE, WILLIAM, of Oswaldtwistle, Lancaster, manufacturing chemist, and EMILE KOPP, of Accrington, Lancaster, chemist. *Improvements in the manufacture of soda-ash and sulphuric acid.* Patent dated October 3, 1854. (No. 2119.)

This invention consists in the substitution of any oxide or carbonate of iron instead of lime or carbonate of lime in the manufacture of black ash or crude soda from which soda-ash is obtained, and in using the sulphuret of iron produced by the process for the purpose of forming or reproducing sulphuric acid.

JEYES, JOHN, of Northampton, seed merchant. *An improvement in the manufacture of paper, threads, and yarns.* Patent dated October 3, 1854. (No. 2120.)

Claim.—Making paper, thread, and yarns from the stalk or stem of the mustard and other plants of the same class.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in motive-power engines, applicable to the working of their valves, and to the conversion of the reciprocating motion of such engines into rotary motion.* (A communication.) Patent dated October 3, 1854. (No. 2121.)

The inventor employs a driving cylinder having on its surface two screw-like projections between which the head of the piston rod works, and by which the reciprocating motion of the piston communicates a rotary motion to the main shaft. Inclined projections are also placed upon the driving cylinder at points diametrically opposite to each other, for the purpose of operating the ordinary slide valves of the steam engine.

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *Improvements in the construction of locks.* (A communication.) Patent dated October 3, 1854. (No. 2122.)

Claim.—Constructing locks in which the lock bolt is prevented from being moved in

either direction, and the lock thereby secured, by means of a combination of movable slides or shutters which can only be moved by the influence of a magnet or magnets, the whole being so combined and arranged that access from the outside to the inside of the lock with any instrument capable of moving the stop pieces is prevented.

Mc NAUGHT, WILLIAM, of Rochdale, Lancaster, engineer. *Improvements in slide-valves for steam engines.* Patent dated October 3, 1854. (No. 2123.)

Claim.—Imparting to the slide-valves of steam engines an additional motion whereby the steam passages leading to the cylinders are closed at required periods of the stroke.

NICKELS, CHRISTOPHER, of the Albany-road, Surrey, and JAMES HOBSON, of Leicester. *Improvements in apparatus used when weaving piled fabrics by the aid of wires.* Patent dated October 3, 1854. (No. 2124.)

This invention consists—1. Of apparatus for introducing flat wires into fabrics when made with warp and weft, and also when made by looping warps; and 2. Of certain apparatus for drawing out the wire from the fabrics.

TOWNEND, WRIGHT, of Harden Bingley, York. *An improvement in combing wool and other fibres.* Patent dated October 3, 1854. (No. 2125.)

This invention is applicable to the carrying comb of a machine in which a circular or endless comb is employed, and the improvements consist in applying a curved or bent plate, (of a corresponding radius with the circular or endless comb), to push the wool or fibre on the carrying comb in a curved form towards the endless comb, so that it may be deposited equally in the latter.

COOPER, THOMAS, of the Isle of Wight, Hampshire, brick-maker. *An improvement in the manufacture and in the mode of joining earthen pipes.* Patent dated October 3, 1854. (No. 2126.)

This invention is described and illustrated on page 367 of this number.

KERSHAW, JOHN, of Stockport, Chester, manager. *Certain improvements in self-acting mules.* Patent dated October 4, 1854. (No. 2127.)

The inventor fits pins and holes, the former of which take into the latter, to the pulley on the stud of the radial arm of the mule, and to the strap which passes over it, so as to avoid or reduce the slipping of the strap.

CHALMERS, DAVID, of Manchester, Lancaster, machinist. *Improvements in the mode or method of working railway breaks and communicating signals.* Patent dated October 4, 1854. (No. 2130.)

This invention "consists in attaching a lever and weight to the centre shaft of the break, which are worked by an endless chain and pulley operating upon the break-blocks, by means of a shaft with one or more universal joints placed longitudinally under the carriage, extending to each end thereof, and communicating with a vertical shaft at the end or side of the carriage by means of bevel wheels or similar contrivances."

GAULTON, WILLIAM PEEL, of Crag Works, near Macclesfield, Chester, mechanical manager. *Improvements in breaks applicable to railway carriages and other vehicles.* Patent dated October 4, 1854. (No. 2131.)

This invention relates to the securing of the break-blocks to the frame, and consists in employing for this purpose a cramp or frame having toothed or fluted jaws which are made to close by the action of screws or wedges.

LEGENTIL, AIMÉ ANTOINE JOSEPH, gentleman, of Arras, French empire. *Certain improvements in pumps or machinery for raising and forcing water and other fluids.* Patent dated October 4, 1854. (No. 2133.)

This invention consists in the employment of compressed air or gas for raising and forcing water and other liquids applied through a blower or air pump on the surface of the liquid introduced into a vessel hermetically closed, through a valve opening inwards in the bottom thereof. A pipe passes through the upper part of this vessel extending nearly to the bottom, and is intended to convey the water away from the vessel. The pipe is fitted at the bottom with a valve opening inwards, and the vessel is furnished at the top with a tube and stop-cock, by means of which a passage can be opened from the interior of the vessel to the external atmosphere.

CROSSLEY, THOMAS, of Scott's-yard, Bush-lane, London, gentleman. *An improved mode of manufacturing printing-blocks.* (A communication.) Patent dated October 4, 1854. (No. 2134.)

This invention consists in a method of applying gutta percha to wooden blocks to form printing surfaces.

PROSSER, THOMAS, of New York, United States of America, but now of Birkenhead, Cheshire, merchant and civil engineer. *Improvements in the manufacture of certain hollow closed vessels, and in the machinery or apparatus employed therein, parts of which improvements are also applicable when preparing for and fastening tubes into steam boilers, or other vessels requiring tubes to be fixed therein.* Patent dated October 4, 1854. (No. 2135.)

This invention mainly consists in temporarily uniting the parts of metallic vessels

by means of pins or dowels, and in then subjecting them to a welding heat and to pressure.

PERRY, JOHN, of Hunslet Old Mill, near Leeds, York, wool-comb maker. *Improvements in preparing wool for combing.* Patent dated October 4, 1854. (No. 2138.)

This invention particularly relates to the machines patented by Mr. Brown, October 18, 1852, and consists 1. In covering the upper feed roller of such machines with vulcanized India rubber or other suitable elastic surface, and 2. In imparting thereto, or to the porcupine feed roller upon which it rests, or to both, a travelling motion across the machine by which means a better action upon the wool under operation is obtained.

MOORE, THOMAS EDWIN, of Great Titchfield-street, Marylebone, Middlesex, engineer. *Certain improvements in machinery or apparatus for curvilinear and annular cuttings in metals and other hard substances.* Patent dated October 5, 1854. (No. 2139.)

This invention consists in adapting a horizontal circular moving disc or round table to ordinary planing machines, so that the said disc or table shall receive the required motion by the longitudinal movement of the sliding bed of the ordinary planing machine to which it is attached.

ADAMS, WILLIAM BRIDGES, of Adam-street, Adelphi, Middlesex, civil engineer. *Improvements in rails for railways, and in the connections and fastenings for rails.* Patent dated October 5, 1854. (No. 2140.)

The inventor describes a variety of forms of rail and modes of fastening them down, which, or portions of which, we shall probably give hereafter.

TINDALL, ENOCH OLDFIELD, of Scarborough, York, ironfounder. *Imprcvements in mangles and wringing-machines for smoothing and wringing clothes and woven fabrics.* Patent dated October 5, 1854. (No. 2141.)

This invention relates to the inventor's patent "Imperial" and "Vertical" mangles, and consists in the use of a lever and sliding-pin for depressing the spring by which the operating rollers are pressed together, and in an arrangement in which two rollers only are employed.

COLLIER, GEORGE, of Halifax, York, engineer. *Improvements in the manufacture of carpets and other terry fabrics.* Patent dated October 5, 1854. (No. 2143.)

These improvements mainly consist in an arrangement by which the instrument that is used for inserting the wire withdraws the one which requires to be withdrawn.

FROST, WILLIAM, of Wine-office-court, Fleet-street, London, engineer. *Improvements in steam engines.* Patent dated October 5, 1854. (No. 2144.)

Claim.—The passing of superheated steam alone or in combination with common steam through an attemperating surface. Also, heating the water in a separate chamber for feed in condensing engines, with either heated or common steam, in combination with or without an attemperator.

BENNETT, THOMAS, of Woodbridge-street, Clerkenwell, Middlesex, gold and silver beater. *Improvements in the apparatus employed in the manufacture of gold, silver, and metal leaf.* Patent dated October 5 1854. (No. 2145.)

The inventor describes a machine for beating out the leaf. The hammer is attached to a bar (connected with a frame) which slides and is guided in two uprights. Under the hammer the anvil is fixed. The bar with the hammer is raised by projections on two connecting rods, each of which is attached at one of its ends to crank pins affixed to two wheels on an axis which receives motion by a strap from one of two conical drums. The mould beneath the hammer has communicated to it a reciprocatory and rotary motion.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HUTCHINSON, WILLIAM, of Salford, Lancaster, engineer, and WILLIAM BARLOW, of the same place, engineer. *Improvements in steam boilers.* Application dated September 28, 1854. (No. 2085.)

This invention relates to such boilers as are provided with one or more flues passing through them, and consists in placing within these flues longitudinal tubular water-chambers communicating with the main part of the boiler by suitable passages.

WOODWARD, JOHN, of Barnet, Hertford, office clerk. *Certain apparatus for stopping shot and other holes in ships and vessels.* Application dated September 28, 1854. (No. 2088.)

This invention very much resembles a former one, described on page 428 of vol. lxi.

BEER, LOUIS, manufacturer, of Elbeuf, (Seine Inferieure), France. *Certain improvements in machinery for shearing piled, terry, or raised fabrics.* Application dated September 28, 1854. (No. 2091.)

These improvements consist in producing by the shearing operation on the fabrics mentioned in the title, designs which hitherto have only been obtained by the Jacquard machine or in the weaving process. This is effected by substituting for the rigid plain table which is placed under the shearing roller and over which the fabrics are made

to pass in ordinary shearing, a cylindrical or movable table or figuring roller which is set rotating by the friction of the cloth or by separate driving.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in machinery for removing the points from the hairs of rabbit and other skins employed in the manufacture of hats, and similar articles.* (A communication.) Application dated September 29, 1854. (No. 2096.)

This invention relates to the cutting or plucking off of the extremities of the hair on rabbit and other skins, so as to leave merely the soft downy fur, by the aid of a series of nippers composed of blades of metal arranged to work in a frame by the action of a crank and connecting-rod.

WILKINSON, WILLIAM, of Nottingham, mechanic. *Improvements in looped pile and cut pile fabrics, and in machinery for brushing or raising a cut pile or fleece upon the web on both sides of the article, or on one side only, by which means he secures a looped web not liable to let down.* Application dated September 30, 1854. (No. 2097.)

"This invention consists in the employment of improved warp machines and stocking frames, and warp machines of the old construction, which machinery is wholly engaged in the manufacture of looped fabrics. For the manufacture of these looped webs I use from one set to four sets of guides for laying the threads upon the needles, by which means the web is produced to be piled or fleeced by the action of the guide bars carrying the guides from one thread to each needle to four threads to each needle, and by this arrangement a pile or fleece surface may be placed on either side of the fabric. By the action of the threads through the guides upon the needles a pile web will appear on one side of the fabric, and a fleece web on the other," &c.

BRADBURY, JAMES, and JOHN BRADBURY, of Denton, Lancaster, machinists. *Improvements in machinery or apparatus for manufacturing or producing piled goods or fabrics.* Application dated September 30, 1854. (No. 2098.)

These improvements apply primarily to the hand loom which piled goods are woven upon double grounds, and consist in the adaptation of tappets for the purpose of working the healds as well as communicating motion, at the same time and from the same source, to the winding on roller. They also relate to the production of the pile of goods woven in double frames.

TUCKER, WILLIAM, of Old Brompton. *Preventing the escape of fuliginous smoke from shafts or flues.* Application dated September 30, 1854. (No. 2099.)

In carrying this invention into effect, whenever fresh coal is placed on the furnace water from a reservoir flows in through a perforated surface, partly falling into a tank beneath and being partly converted into steam by impinging against the heated walls of the flue and caloric bars placed within the flue; the water thus falling towards the reservoir carries down the solid portions of the smoke which are removed with it through the waste pipe.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in suspended purchases.* (A communication.) Application dated October 2, 1854. (No. 2105.)

This invention consists in raising, conveying, and lowering heavy bodies employed in the erection of bridges, &c., over streams or ravines, by means of suitable cables, tackles, and other apparatus stretched across from point to point, forming a fixed track upon which suitable carriages and adjusting apparatus traverse.

GRAY, THOMAS, of St. Clement's-lane, Strand, Westminster, printing-ink manufacturer. *A new and improved method of preparing and bleaching raw and fabricated fibrous substances now used in the manufacture of paper, or which are applicable to be used in such manufacture.* Application dated October 2, 1854. (No. 2106.)

This invention consists in immersing the material to be bleached a second time in a solution of alkali, potash, soda, or soda ash, and also in a hot solution of chlorine.

WALL, GEORGE, of Manchester, Lancaster. *Improvements in the manufacture of railway tickets and other similar articles from a substance or material capable of being re-used.* Application dated October 2, 1854. (No. 2107.)

The inventor proposes to employ gutta percha, caoutchouc, or any combination of either, in the manufacture of railway tickets, &c.

PARTINGTON, WILLIAM, of Bonbill, Dumbarton, bleacher. *Improvements in bleaching.* Application dated October 2, 1854. (No. 2110.)

The materials to be bleached are first washed in pure water; then scoured by means of muriatic acid, which may be used either hot or cold, the acid being afterwards washed out of them; then boiled in a mixture of rosin and alkali for about twelve hours, being again well washed afterwards; then again scoured by means of muriatic acid as before; then steeped in a solution of chlorate of lime for about four hours; and finally are again scoured by means of muriatic acid, hot or cold, and well washed in pure water.

DURAND, FRANÇOIS, of Paris, France, mechanician. *Certain improvements in looms*

for weaving. Application dated October 2, 1854. (No. 2111.)

This invention consists in certain arrangements for the application of magnets to machines for weaving.

HARE, JOHN BOWLES, of Bristol, floorcloth manufacturer. *An improved mode of manufacturing printing-blocks*. Application dated October 2, 1854. (No. 2112.)

This invention is intended to facilitate the operation of grooving blocks for printing floor-cloths, and for this purpose is provided a series of rotary saw blades, secured to a common shaft, and set at suitable distances apart.

BENNETT, NICHOLAS, of Furnival's-inn, Holborn, Middlesex, gentleman. *A substitute for the scaffolding at present employed in and for the erecting and repairing of buildings*. (A communication.) Application dated October 2, 1854. (No. 2113.)

The inventor employs sockets of metal or other suitable material, which he builds in with the brickwork of the building, disposing them at suitable distances for rendering them available for the reception of projecting bracket pieces for supporting a temporary stage formed of planks laid side by side.

STEPHENS, JOHN, of the Temple, gentleman. *Improvements in apparatus for supplying purified air to rooms or buildings*. Application dated October 2, 1854. (No. 2116.)

In carrying out this invention the inventor employs a close chamber divided by several shelves or partitions, in such manner that the air in passing through it shall be forced to take a tortuous direction, and in doing so is brought in contact with charcoal and other matters for purifying the air and for depriving it of moisture. There are also partitions of woollen fabric to filter the air through so as to remove any dust or other solid impurities.

THOMAS, FREDERICK SAMSON, of Cornhill, London, and Hook's-villa, Fulham, Middlesex, gentleman. *Improvements in locomotives*. Application dated October 4, 1854. (No. 2128.)

The inventor employs atmospheric air, which he collects by means of bellows of fan-like construction affixed to and worked by the axles or the wheels of the carriages; this air he then conveys into reservoirs and bellows which are compressed by the rotation of a laden disc, and subsequently expands it by the application of caloric.

THOMAS, FREDERICK SAMSON, of Cornhill, London, and Hook's-villa, Fulham, Middlesex, gentleman. *An improved mode of obtaining motive power*. Application dated October 4, 1854. (No. 2129.)

The inventor constructs a wheel with certain arms or chambers upon or within which he places weighty balls, or fluids, which approach the periphery of the wheel upon the descending side and the centre of it upon the ascending side; "and by the greater leverage on the descending side," he says, "I provide the power by which the wheel obtains and sustains its own rotative movement."

DISHER, JOHN, of Edinburgh, Scotland, brewer. *Improvements in mashing-apparatus for brewing*. Application dated October 4, 1854. (No. 2132.)

The improved machine, which is of a portable form, consists of a case within which is contained a shaft furnished with a set of beaters or dividers made to operate upon the malt by means of power suitably applied to the shaft.

PHILLIPS, WILLIAM HENRY, of Camberwell New-road, Surrey, engineer. *Improvements in rotatory steam engines*. Application dated October 4, 1854. (No. 2136.)

This invention consists of a peculiar combination of parts whereby water or other fluid is put into rotatory motion and caused to act on floats or paddles on arms affixed to an axis.

RAMMELL, THOMAS WEBSTER, of Trafalgar-square, Middlesex. *Improvements in steam-boiler and other furnaces*. Application dated October 5, 1854. (No. 2137.)

This invention consists in burning fuel on a close surface, the air for supporting combustion being introduced through perforated air channels or passages of fireclay.

HARRIS, THOMAS, of Nantyglo, Aberystruth, Monmouth, engineer. *Separating the steam from the condensed water and mud in its transit from the boiler to the cylinder of a steam engine, stationary or locomotive*. Application dated October 5, 1854. (No. 2142.)

In carrying out this invention the steam with the condensed water and mud from the boiler is to be discharged into a chamber connected to the steam pipe to the bottom of which chamber the water and mud descend, whilst the steam alone passes through the other division of the pipe to the cylinder.

PROVISIONAL PROTECTIONS.

Dated March 27, 1855.

674. John Cooke Bourne, of Holmes-terrace, Kentish-town, Middlesex, artist. Improvements in photographic apparatus.

676. William Yates the younger, of Woburn-place, Russell-square, Middlesex, gentleman. Improvements in the treatment of grain from which beer or spirit has been made.

678. John Getty, of Liverpool, Lancaster, shipbuilder. An improvement in the construction of steam and other vessels.

Dated March 28, 1855.

680. George Leonard Turney, of Wood-street, Cheapside, London, needle and pin manufacturer.

An improved mode of arranging or packing pins and needles for sale.

682. John Shae Perring, of Radcliffe, Lancaster, civil engineer. Improvements in the permanent way of railways.

684. François Ettienne Hudde, mechanical engineer, and Jean Baptiste Emmanuel Fouquet, gentleman, of Rue de l'Echiquier, Paris. Certain improvements in the construction of pyrometers.

686. William Dray, of Swan-lane, Middlesex, engineer. An improved gear for communicating power from horses or cattle for the purpose of driving machinery. A communication.

688. Ernest Hannibal Becker, of Altham, Lancaster, manufacturer. A new or improved projectile.

690. Thomas M'Low, of Middle-row, Holborn, Middlesex, gentleman. Improvements in screw-propellers.

692. Joseph Peabody, of Old Broad-street, London, gentleman. Improved machinery for obtaining motive power by the action of the wind. A communication.

Dated March 29, 1855.

694. John Gedge, of Wellington-street South, Middlesex. Improvements in the means of stopping or retarding railway-trains. A communication from Franz Steigerwald Heinrich Schirges and Carl Fuchs, of Munich, Bavaria.

696. Marie Jeanne Thérèse Gillot, widow, and Cécile Celestine Beauvais, of Upper Charlotte-street, Fitzroy-square, London. Improvements in purifying grain, vegetable or botanical matter, and cochineal.

698. James Porritt, of Stubbins Vale Mills, near Ramsbottom, Lancaster, manufacturer. Certain improvements in steam-engines.

700. John Blair, of Glasgow, Lanark, hat manufacturer. Improvements in hats and other coverings for the head.

702. John Henry Johnson, of Lincoln's-inn-fields, Middlesex. Improvements in anchors. A communication from Louis Frederic François David, of Havre, France, chain manufacturer.

Dated March 30, 1855.

704. Henry William Parnell, of Bryanstone-square, London. The improvement in the construction of ships and boats, so as to increase their buoyancy and diminish their rolling motion.

708. William Swain, of Birmingham, Warwick, gentleman. Certain improvements in furnaces for japanners' stoves, ovens, boilers, and kilns, and which improvements are also applicable to other fire places, by which combustion is rendered more complete and the fuel thereby greatly economised.

712. Joseph Morgan, of Manchester, manufacturer of plaited wicks. An improvement in the manufacture of candles in which tallow is used.

714. Edward Vansittart Neale, of Russell-place, Middlesex, esquire, and Thomas Dawson, of King's Arms-yard, London, manufacturer. Improvements in handles and parts of handles for umbrellas, walking-sticks, knives, and for other like articles, and for articles of furniture, in stoppers, finger-plates, medallions, jewellery, furniture, and other decorative articles.

716. Theophilus Wood Bunning, of Newcastle-upon-Tyne, engineer. Improvements in steam-engines.

Dated March 31, 1855.

718. Charles Whitley, of Manchester, Lancaster self-acting tool-maker. Improvements in machinery or apparatus for drilling.

720. William Corbitt, of Elm-tree Bank, Rotherham, York, stove grate manufacturer. Improvements in warming and ventilating apartments, parts of which improvements are applicable to the prevention of smoky chimneys.

722. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved mode of constructing centrebits. A communication.

724. George Fergusson Wilson and George Payne, of Belmont, Vauxhall. An improvement in treating oils to obtain an elastic product.

726. Elizabeth Abbott and Matilda Abbott, of Horningsea, Cambridge, gentlewomen. Improvements in stays.

Dated April 2, 1855.

728. Adolphe Emile Lambert Charles Timmerhans, of Liège, Belgium. Forcing projectiles applicable to artillery as well as to portable fire-arms.

730. James Shand, of the firm of Shand and Mason, Blackfriars-road, Surrey, fire-engine manufacturers. Improvements in fire-engines.

732. Charles Crews, of Montague-terrace, Bow-road, and Henry George Gray, of St. James'-street, Middlesex. Improvements in preparing and using deodorizing or disinfecting compounds.

734. Richard Peyton, of the Bordesley Works, Birmingham. Improvements in the manufacture of iron gates and fences.

736. William Lund, of Fleet-street, London, manufacturer, and William Edward Hipkins, foreman to William Lund. Improvements in the manufacture of cork-screws.

Dated April 3, 1855.

738. Robert Christopher Witty, of Terrace-avenue, Camden-road-villas, Middlesex, civil engineer. An improved method of reflecting and diffusing solar light.

740. Thomas Prideaux, of Birmingham, Warwick, farmer and hotel keeper. A new or improved plough for draining and other similar purposes.

742. Hiram Powers, of Florence, in Tuscany, sculptor. Forming perforations or throats to the cutting edges of files or rasps for allowing the particles cut away to pass through, and to prevent the instrument from clogging or choking.

744. William Eathorne Gill, of Totnes, Devonshire, engineer, and Henry Brinsley Sheridan, of Parsons-green, Middlesex, gentleman. Treating fish for oil, and utilising the products of said process.

746. Jacob Maas and James Adams, of White Hart-yard, Southwark, Surrey, millwrights and millstone-makers. Improvements in mills for splitting or grinding beans, peas, corn, and all kinds of grain.

748. Henry Richardson Fanshawe and John Americus Fanshawe, of North Woolwich, Essex, manufacturing agents. Certain improvements in the manufacture of waterproof fabrics of the vulcanised, sulphurised, or cured class.

750. Maximilien Evrard, civil engineer, of Saint Etienne, French empire. An improved continuous drawing compresser for moulding or bruising several substances or mixtures.

752. Christopher Nickels, of the Albany-road, Surrey, and James Hobson, of Leicester. Improvements in weaving pile fabrics when wires are used.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April* 17*th*, 1855.)

2572. Ferdinand Cellier Blumenthal and Maximilian Louis Joseph Chollet. Preserving meats.

2587. John Cortland. The safety of life at sea or in rivers.

2599. François Jacquot. Improvements in the lining of hats, helmets, shakos, caps, and similar articles.

2601. Charles Thompson Guthrie. Improvements in angles, T squares, straight edges, parallel rules, and other similar instruments employed in drawing.

2608. Francis Puls. Improvements in electro-galvanic apparatus for medical purposes, part of

which improvements are also applicable to other electro-galvanic apparatus.

2612. George Henry Bachhoffner. Improvements in the construction of fire-places for the better consumption of smoke and in lighting and maintaining fires.

2613. Timothy White. Improvements in constructing portable houses and other buildings and structures.

2615. Jos Mayer and John David Kind. An improvement or improvements in door knobs or handles made of china, earthenware, glass, or other vitreous or semi-vitreous substance, and in attaching the said knobs or handles to their spindles.

2616. Charles Frederick Stansbury. A machine for cutting keys. A communication.

2620. Peter Armand Lecomte de Fontainemoreau. Improvements in photography. A communication.

2632. Llewellyn William Evans and James McBryde. Certain improvements in the burning of sulphuret ores for making sulphuric acid, and for smelting.

2637. Louis Cornides. Certain improved apparatus for coating or covering surfaces of glass or other material with collodion.

2649. John Sykes. Improvements in piecing machines, a part of which improvements are applicable to other similar purposes.

2652. Matthew Curling Friend and William Browning. An apparatus for determining the magnetic aberrations occasioned by local attraction.

2655. Robert Lucas Chance. An improvement in the manufacture of glass.

2661. William Gilpin and Abraham Bowen. A new method for the effectual consumption or prevention of smoke, and the more perfect combustion of coals and other fuel by means of a mechanical apparatus and furnace bars of a certain construction; a portion of the same may be applied for raising water, and in furnaces where blast is required.

2662. William Hartley. Improvements in safety valves for steam boilers and in steam engines.

2703. Alfred Suter. A wind-guard to cure smoky chimneys, or ventilaterooms or buildings.

113. James Simpkin. Improvements in rifles and other fire-arms.

121. Ambroise Quertinier. An improvement in glass furnaces.

174. William Dray. An improved machine for cutting chaff.

222. John Henry Johnson. Improvements in looms for weaving. A communication from Gustave Bornèque, of Bavillers, France, manufacturer.

258. Edmund Clegg and James Leach. Improvements in temples for looms.

327. Richard Shirley Harris. Improvements in the manufacture of looped fabrics.

414. William Brown. Certain improvements in machinery for printing.

538. Samuel Cunliffe Lister. Improvements in machinery for combing wool and other fibres.

584. Robert More Butt. Improvements in the manufacture of night lights.

610. Vincent Scully and Bennett Johns Heywood. An improved mode of regulating the supply of gas to gas-burners.

616. Richard Edward Hodges. Improvements in door springs.

617. Alexander Robert Terry. Improvements in apparatus for copying letters and other documents.

632. John Morrison. An improvement or improvements in the manufacture of metallic pens.

638. Charles Carnell. Certain improvements in the manufacture of bricks.

640. George Whyatt. Certain improvements in machinery or apparatus for cutting piled goods or fabrics.

644. Charles Frederick Behn. Improvements in machinery for making moulds for casting metal. A communication from David Brown, of Baltimore, United States of America.

652. James Niven. Improvements in the manufacture of paper, and in the production of textile materials.

655. William Brown. An improved mode of preparing sewing-silk for the market.

662. George Allam Barrett, William Exall, and Charles James Andrewes. Certain improvements in portable and fixed combined threshing-machines.

668. Francis Crossley. Improvements in the manufacture of mosaic rugs.

674. John Cooke Bourne. Improvements in photographic apparatus.

680. George Leonard Turney. An improved mode of arranging or packing pins and needles for sale.

690. Thomas McLow. Improvements in screw propellers.

700. John Blair. Improvements in hats, and other coverings for the head.

714. Edward Vansittart Neale and Thomas Dawson. Improvements in handles and parts of handles for umbrellas, walking-sticks, knives, and for other like articles, and for articles of furniture in stoppers, finger plates, medallions, jewellery, furniture, and other decorative articles.

720. William Corbitt. Improvements in warming and ventilating apartments, parts of which improvements are applicable to the prevention of smoky chimneys.

746. Jacob Maas and James Adams. Improvements in mills for splitting or grinding beans, peas, corn, and all kinds of grain.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed April 13, 1855.

2189. Sir James Caleb Anderson.
2191. Charles Frederick Stansbury.
2193. William James Barsham.
2195. John Harrison.
2200. Christopher Holt.
2201. Robert Pinkney.
2205. John Henry Pape.
2208. John Bonnall.
2216. George Scheutz and Edward Scheutz.
2304. John Wainwright.
2314. Thomas Prosser.
2488. John Davie Morries Stirling.

1855.

250. George Ritchie.
282. William Sandford Roberts.
284. John Grainger.
290. George Tomlinson Bousfield.
306. William Bridges Adams.

Sealed April 17, 1855.

2218. Louis Cornides.
2221. Alfred Illingworth and Henry Illingworth.
2223. Robert John Chippindall.
2230. John Mason and William Robertson.

2236. Samuel Mason and William Beeby.
2237. Peter Armand Lecomte de Fontainemoreau.
2238. John Platt.
2245. Julius Smith and Frank Sandom Thomas.
2248. John Jamieson.
2253. Henry Hales.
2262. François Jean Bouwens.
2267. John Welsh.
2272. Richard Roberts.
2284. Charles Henry Olivier.
2301. Richard Archibald Brooman.
2317. Bewicke Blackburn.
2377. Ignace Porro.
2452. Richard Keefe.
2561. Peter Armand Lecomte de Fontainemoreau.
2718. Charles Henfrey.
2719. Warren De la Rue.

1855.

67. Henry Bessemer.
211. Peter Armand Lecomte de Fontainemoreau.
239. Martin Samuelson and Alexander Samuelson.
255. James Timmins Chance.
283. George Audemars.
287. John Grove Johnson.
301. George Fergusson Wilson.

Sealed April 18, 1855.

2229. George Hamilton.
2233. Howard Ashton Holden.
2235. Benjamin Nicoll.

NOTICES TO CORRESPONDENTS.

J. Emmet.—It was not possible to make the addition you suggest after your second letter reached us, or it should have been done with pleasure.

C. G. (*Pimlico.*)—We shall be glad to receive your address.

CONTENTS OF THIS NUMBER.

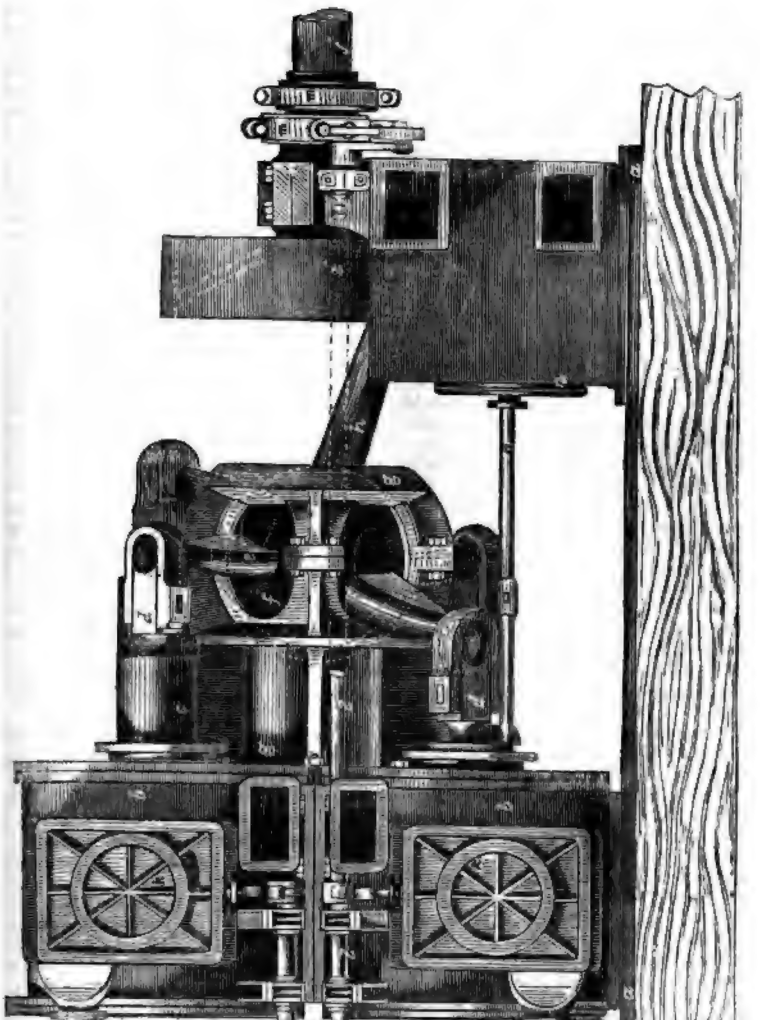
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani Rue Vivienne Paris; Mason and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

'o. 1655.] SATURDAY, APRIL 28, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

BISHOPP'S PATENT METHOD OF COMMUNICATING POWER TO REVOLVING SHAFTS.



BISHOPP'S PATENT METHOD OF COMMUNICATING POWER TO REVOLVING SHAFTS.

(Patent dated July 4, 1854.)

Mr. G. D. Bishopp, of Inverness-terrace, Middlesex, the patentee of the Disc Engine, has patented a new method of applying the reciprocatory action of two or more pistons to the production of rotary motion in a common shaft.

In applying the invention to a steam engine having four cylinders, for example, he places the cylinders side by side round a central line, which, if produced towards the engine shaft, would coincide with the centre line of that shaft. "Between the ends of the cylinders and a crank fixed on the end of the engine shaft, he fixes a frame or headstock, to carry a ball and socket joint, or a universal joint, the centre of the joint being in the same centre line as the engine shaft; and to or into this ball or universal joint is fixed one end of a strong shaft or arm, the other end of which enters a hole in the crank on the engine shaft, which hole may be either bushed or fitted with brasses, similar to a plummer block; and to or into this ball or universal joint are fixed or attached as many other shafts or arms as there are cylinders, the centre lines of these shafts or arms being at right angles, or nearly so, with the shaft or arm mentioned before, which enters and is to drive the crank. These other shafts or arms are so fixed that one end of each shall be over or opposite, or nearly over or opposite, the centre of its respective cylinder. To each piston or piston rod is fitted, by a ball and socket or universal joint, one end of a connecting rod, the other end of that connecting rod being fitted to or taking hold of, by a ball and socket or universal joint, the end of one of the shafts or arms which is over or opposite that piston. The cylinders are to be fitted with steam slides or valves of the usual construction, which may be worked in the usual way by eccentrics or cranks on the engine shaft, or by a motion obtained from the shafts or arms before mentioned, or from the ball and socket or universal joint which is carried by the headstock. The air-pumps of condensing engines and other pumps may be worked by either of the methods employed for working the slides, or they may be worked by rods attached direct to the pistons of the steam cylinders. Another method of working the air and other pumps is to place them between and alongside the steam cylinders, and to work them by means of arms fixed into or attached to the ball of the socket joint or the universal joint carried by the headstock. Upon turning round the engine shaft and crank, the pistons will reciprocate, and, of course, if steam or any fluid or gas (under pressure) be admitted into the cylinders at the proper periods, the reverse action will take place, and the pistons will reciprocate and cause the engine shaft to revolve. The engine may be placed, with the cylinders and engine shaft, either in a vertical or horizontal position, or inclined at any angle. Instead of several arms being attached to the central ball or universal joint, a thick circular plate may be fixed or attached to the ball or joint, and the connecting rods can be attached to the plate by ball and socket or universal joints. Engines can be made on this plan with two, three, or a greater number of cylinders, and can of course be driven by high or low pressure steam, condensing or non-condensing, by water pressure, or by the elastic pressure of any fluid or gas."

The engraving on the preceding page is a side elevation of the invention as applied to a four-cylinder engine, such as would be suitable for driving a screw-propeller. The bed or foundation plate is seen at *a a*, and the four cylinders at *b b*. These are shown fitted with pistons, having trunks, *c c*. The connecting rods, *d d*, are attached at one end by ball and socket or universal joints to the pistons and piston trunks, *c c*, and by their opposite ends to the ends of arms, *e e*, which are secured in the central ball or universal joint, *f*. The headstock, *g g*, forms the socket for carrying the ball, *f*, and is bolted to lugs cast on the cylinders. From the centre of the ball, *f*, and at right angles to the plane passing through the ends of the arms, *e e*, is the crank arm, *h*, the outer end of which enters a bush or plummer block in the crank, *i*, of the main shaft, *j*. The valve boxes are shown at *k k*, and as they are of the ordinary construction, and worked in the usual manner, it will not be necessary to give any description of them further than to say, that they are operated by means of the shafts, *l l*, which are actuated by the eccentrics, *m m*, on the main shaft, *j*. The pistons or plungers of the air-pumps are worked by means of the rods, *o o*, the opposite ends of which are connected to the trunks, *c c*, of the lower cylinders, *b b*, and are worked thereby.

ELEMENTARY DEMONSTRATIONS OF PROPOSITIONS IN THE THEORY OF MAGNETIC FORCE.

BY PROFESSOR W. THOMSON.

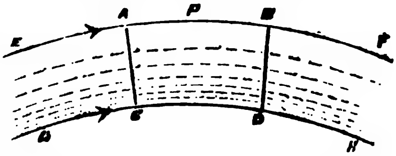
Def. 1. The lines of force due to any magnet or electro-magnet, or combination of magnets of any kind, are the lines that would be traced by placing the centre of gravity of a very small steel needle, perfectly free to turn about this point, in any position in their neighbourhood, and then carrying it always in the direction pointed by the magnetic axis of the needle.

Remark. Except in the cases of symmetrical magnets, the lines of force will generally be lines of double curvature, and no set of them will lie in one plane.

Def. 2. The lines of component force in any plane are the lines traced by placing the centre of gravity of a steel needle anywhere in this plane, and carrying it always in this plane in the nearest direction to that pointed by its magnetic axis; that is, the direction of the orthogonal projection of the magnetic axis on the plane; or the direction that the steel needle would point with its magnetic axis if placed with it in the plane, and free to turn about an axis through its centre of gravity perpendicular to the plane.

Prop. I. If the line of component magnetic force through any point in a plane be curved at this point, the force will vary in a line perpendicular to the line of force in its plane, *increasing* in the direction *towards* the centre of curvature.

Let EABF be a line of component force in the plane of the diagram, and let GCDH be another near it, each and all between them being curved in the same direction, the arrow head on each indicating the way a north pole would be urged. Let AC, BD be lines drawn perpendicular to all the lines of component force between these two. Because of the curvature of these lines, the lines AC and BD (whether straight or curved) must be so inclined to one another that the portion CD cut off from the last shall be less than the portion AB cut off from the first. Let a north pole of an infinitely thin uniformly and longitudinally magnetized bar, of which the south pole is at a great distance from the magnets, be carried from D to C along the line of component force through these points, from C to A perpendicular to all the lines of force traversed, from A to B again along a line of force, and lastly, from B to D perpendicular to the lines of force. Work must be spent on it in carrying it from C to D, and work is gained in passing it from A to B. Then, because no work is either gained or spent in carrying it from C to A or from B to D, the work gained in moving along AB cannot exceed the work spent in the first part of the motion, or else we should have a perpetual development of energy from no source,* by simply letting the cycle of motion be repeated over and over again: and



the work spent along DC cannot exceed that gained from A to B, or else we might have a perpetual development of energy from no source, merely by reversing the motion described, and so repeating. The work spent and gained in the motions along DC and AB respectively must therefore be exactly equal. Hence the mean intensity of the force along CD, which is the shorter of the two paths, must exceed the mean intensity of the force along the other; and therefore the intensity of the force increases from P in the perpendicular direction towards which the concavity of the line through it is turned.

* [Note added March 26, 1855.]—It might be objected, that perhaps the magnet, in the motion carried on as described, would absorb heat, and convert it into mechanical effect, and therefore that there would be no absurdity in admitting the hypothesis of a continued development of energy. This objection, which has occurred to me since the present paper was written, is perfectly valid against the reason assigned in the text for rejecting that hypothesis; but the second law of the dynamical theory of heat (the principle discovered by Carnot, and introduced by Clausius and myself into the dynamical theory, of which, after Joule's law, it completes the foundation) shows the true reason for rejecting it, and establishes the validity of the remainder of the reasoning in the text. In fact, the only absurdity that would be involved in admitting the hypothesis that there is either more or less work spent in one part of the motion than lost in the other, would be the supposition that a thermo-dynamic engine could absorb heat from matter in its neighbourhood, and either convert it wholly into mechanical effect, or convert a part into mechanical effect, and emit the remainder into a body of a higher temperature than that from which the supply is drawn. The investigation of a new branch of thermo-dynamics, which I intend shortly to communicate to the Royal Society of Edinburgh, shows that the magnet (if of magnetised steel) does really experience a cooling effect when its pole is carried from A to B, and would experience a heating effect if carried in the reverse direction. But the same investigation also shows that the magnet must absorb just as much heat to keep up its temperature during the motion of its pole *with* the force along AB, as it must emit to keep from rising in temperature when its pole is carried *against* the force, along DC.

Prop. II. The augmentation of the component force in any plane at an infinitely small distance from any point, towards the centre of curvature of the line of the component force through it, bears to the whole intensity at this point the ratio of the infinitely small distance considered, to the radius of curvature.

If, in the diagram for the preceding proposition, we suppose AB and CD to be infinitely near one another, and each infinitely short, they will be infinitely nearly arcs of circles with infinitely nearly equal radii. Hence the difference of their lengths must bear to either of them the ratio of the distance between them to the radius of curvature. But the mean intensities along these lines must, according to the preceding demonstration, be inversely as their lengths, and hence the excess of the mean intensity in CD above the mean intensity in AB must bear to the latter the ratio of the excess of the length of AB above that of CD to the latter length; that is, as has been shown, the ratio of the distance between AB and CD to the radius of curvature.

Prop. III. The total intensity does not vary from any point in a magnetic field to a point infinitely near it in a direction perpendicular to the plane of curvature of the line of force through it.

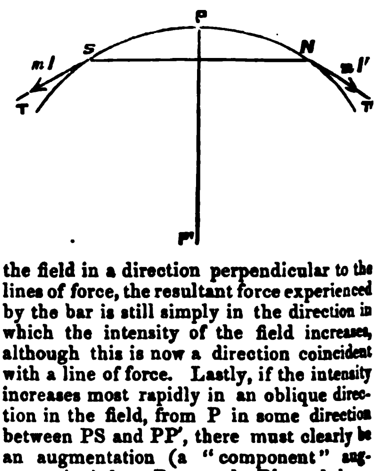
Prop. IV. The total intensity increases from any point to a point infinitely near it in a direction towards the centre of curvature of the line of force through it, by an amount which bears to the total intensity itself, the ratio of the distance between these two points to the radius of curvature.

These two propositions follow from the two that precede them by obvious geometrical considerations.

[They are equivalent to asserting, that if X, Y, Z denote the components, parallel to fixed rectangular axes, of the force at any point whose co-ordinates are (x,y,z) the expression $Xdx+Ydy+Zdz$ must be the differential of a function of three independent variables.]

Examination of the Action experienced by an infinitely thin uniformly and longitudinally magnetized bar, placed in a non-uniform Field of Force, with its length direct along a line of force.

Let SN be the magnetized bar, and ST, NT′ straight lines touching the line of force in which, by hypothesis, its extremities lie, and P a point on it, midway between them. The resultant force on the bar will be the resultant of two forces pulling its ends in the lines ST, NT′. If these two forces were equal (as they would be if the intensity of the field did not vary at all along a line of force; as, for instance, when the lines of force are concentric circles, as they are when simply due to a current of electricity passing along a straight conductor; or if P were in a situation between two dissimilar poles symmetrically placed on each side of it), the resultant force would clearly bisect the angle between the lines TS, T′N, and would therefore be perpendicular to the bar and to the lines of force in the direction towards which they are curved; that is (Prop. IV.), would be from places of weaker to places of stronger force, perpendicularly across the lines of force. On the other hand, if the line of force through P has no curvature at this point, or no sensible curvature as far from it as N and S, the lines NT and ST′ will be in the same straight line, and the resultant force on the bar will be simply the excess of the force on one end above that on the other acting in the direction of the greater; and since in this case (Prop. IV.) there is no variation of the intensity of the force in



the field in a direction perpendicular to the lines of force, the resultant force experienced by the bar is still simply in the direction in which the intensity of the field increases, although this is now a direction coincident with a line of force. Lastly, if the intensity increases most rapidly in an oblique direction in the field, from P in some direction between PS and PP′, there must clearly be an augmentation (a "component" augmentation) from P towards P′; and therefore (Prop. IV.) the line through P must be curved, with its concavity towards P′, and also a "component" augmentation from N towards S, and therefore the end S must experience a greater force than the end N. It follows that the magnet will experience a resultant force along some line in the angle SNP′, that is, on the whole from places of weaker towards places of stronger force, obliquely across the lines of force.

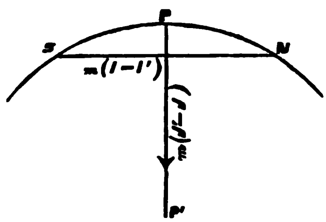
Prop. V. (*Mechanical Lemma.*) Two forces infinitely nearly equal to one another, acting tangentially in opposed directions on the extremities of an infinitely small chord of a circle, are equivalent to two forces respectively along the chord and perpendicular to it through its point of bisection,

of which the former is equal to the difference between the two given forces and acts on the side of the greater; and the latter, acting towards the centre of the circle, bears to either of the given forces the ratio of the length of the arc to the radius.

The truth of this proposition is so obvious a consequence of "the parallelogram of forces," that it is not necessary to give a formal demonstration of it here.

Prop. VI. A very short, infinitely thin, uniformly and longitudinally magnetized needle, placed with its two ends in one line of force in any part of a magnetic field, experiences a force which is the resultant of a longitudinal force equal to the difference of the forces experienced by the ends, and another force perpendicular to it through its middle point equal to the difference between the force actually experienced by either end, and that which it would experience if removed, in the plane of curvature of the line of force, to a distance equal to the length of the needle, on one side or the other of its given position.

NS being the bar as before, let I denote the intensity of the force in the field at the point occupied by N, I′ the intensity at S, J the intensity at P on the line of force



midway between S and N, and J′ the intensity at a point P′, at a distance PP′ equal to the length of the bar, in a direction perpendicular to the line of force. Then if m denote the strength of magnetism of the bar, mI and mI' will be the forces on its two extremities respectively. Hence by the mechanical lemma, the resultant of these forces will be the same as the resultant of a force $m(I-I')$ acting along the bar in the direction SN, and a force perpendicular to it towards the centre of curvature, bearing the same ratio to either mI or mI', or to mJ (which is their mean, and is infinitely nearly equal to each of them), as NS to the radius of curvature, or (by Prop. II.) the ratio of the excess of the intensity at P′ above that at P to the intensity at either, that is the ratio of $J'-J$ to J, and therefore itself equal to $m(J'-J)$. The bar therefore experiences a force the same as the resultant of $m(I-I')$ acting along it from S towards N, and $m\,(J'-J)$ perpendicularly across it towards P′, through its middle point.

Cor. The direction of the resultant force on the bar is that in which the total intensity of the field increases most rapidly; or, which is the same, it is perpendicular to the surface of no variation of the total intensity.

Prop. VII. The resultant force on an infinitely small magnet of any kind placed in a magnetic field, with its magnetic axis along the lines of force, is in the line of most rapid variation of the total intensity of the field, and is equal to the magnetic moment of the magnet multiplied by the rate of variation of the total intensity per unit of distance; being in the direction in which the force *increases* when the magnetic axis is "direct," (that is, in the position it would rest in if the magnet were free to turn about its centre of gravity).

Cor. 1. The resultant force experienced by the magnet will be in the contrary direction, that is, the direction in which the total intensity of the field diminishes most rapidly, when it is held with its magnetic axis reverse along the lines of force of the field.

Cor. 2. A ball of soft iron, or of any non-crystalline paramagnetic substance, held anyhow in a non-uniform magnetic field, or a ball or small fragment of any shape, of any kind of paramagnetic substance, whether crystalline or not, left free to turn about its centre of gravity, will experience a resultant force in the direction in which the total intensity of the field increases most rapidly, and in magnitude equal to the magnetic moment of the magnetization induced in the mass multiplied by the rate of variation of the total intensity per unit distance in the line of greatest variation in the field. For such a body in such a position is known to be a magnet by induction, with its magnetic axis direct along the lines of force.

Cor. 3. A ball of non-crystalline diamagnetic substance held anyhow in a magnetic field, or a small bar or fragment of any shape of any kind of diamagnetic substance, crystalline or non-crystalline, held by its centre of gravity, but left free to turn about this point, experiences the same resultant force as a small steel or other permanent magnet substituted for it, and held with its magnetic axis reverse along the lines of force. For Faraday has discovered that a large class of natural substances in the stated conditions experience no other action than *a tendency from places of stronger towards places of weaker force, quite irrespective of the directions the lines of force may have*, and he has called such substances diamagnetics.

Cor. 4. A diamagnetic, held by its centre of gravity but free to turn about this point, must react upon other magnets with the same forces as a steel or other magnet substituted in its place, and held with its magnetic axis reverse along the lines of force due to all the magnets in its neighbourhood.

Cor. 5. Any one of a row of balls or cubes of diamagnetic substance held in a magnetic field with the line joining their centres along a line of force, is in a locality of less intense force than it would be if the others were removed; but any one ball or cube of the row, if held with the line joining their centres perpendicularly across the line of force, is in a locality of more intense force than it would be if the others were removed.

Cor. 6. When a row of balls or cubes, or a bar, of perfectly non-crystalline diamagnetic substance, is held obliquely across the lines of force in a magnetic field, the magnetic axis of each ball or cube, or of every small part of the substance, is nearly in the direction of the lines of force, but slightly inclined from this direction towards the direction perpendicular to the length of the row or bar. Hence, since the magnetic axis of every part differs only a little from being exactly *reverse along the lines of force*, the direction of the resultant of the couples with which the magnets, to which the field is due, act on the parts of the row or bar must be such as to turn its length along the lines of force.

Cor. 7. The positions of equilibrium of a row of balls or cubes rigidly connected, or of a bar of perfectly non-crystalline diamagnetic substance, free to move about its centre of gravity in a perfectly uniform field of force, are either with the length along or with the length perpendicularly across the lines of force: positions with the length along the lines of force are stable; positions with the length perpendicularly across the lines of force are unstable.

Cor. 8. The mutual influence and its effects, referred to in Cors. 5, 6, 7, is so excessively minute, that it cannot possibly have been sensibly concerned in any phenomena that have yet been observed; and it is probable that it may always remain insensible, even to experiments especially directed to test it. For the influence of the most powerful electro-magnets induces the peculiar magnetic condition of which diamagnetics are capable, to so slight a degree as to give rise to only very feeble, scarcely sensible, mutual force between the diamagnetic and the magnet; and therefore the magnetizing influence of a neighbouring diamagnetic, which could scarcely, if at all, be observed on a piece of soft iron, must be inappreciably small on another diamagnetic.

Cor. 9. All phenomena of motion that have been observed as produced in a diamagnetic body of any form or substance by the action of fixed magnets or electro-magnets, are due to the resultant of forces urging all parts of it, and couples tending to turn them; the force and couple acting on each small part being the same as it would be if all the other parts were removed.

Cor. 10. The deflecting power (observed and measured by Weber) with which a bar of non-crystalline bismuth, placed vertically as core in a cylinder electro-magnet (a helix conveying an electric current), urges a magnetized needle on a level with either of its ends, is the reaction of a tendency of all parts of the bar itself from all places of stronger towards places of weaker force in its actual field.

The preceding investigation, leading to Props. VI. and VII., is the same (only expressed in non-analytical language) as one which was first published in the *Cambridge and Dublin Mathematical Journal*, May, 1846. The chief conclusions now drawn from it, with particulars not repeated, were stated in a paper entitled "Remarks on the Forces experienced by inductively magnetized Ferromagnetic or Diamagnetic Substances," in the *Philosophical Magazine* for October, 1850.

Glasgow College, March 15, 1855.

Philosophical Magazine.

RAILWAY SWITCHES AND CROSSINGS.

A paper on "The Construction of Railway Switches and Crossings" was read at the Institution of Civil Engineers, on the evening of Tuesday, April 17, by Mr. B. Burleigh, Assoc. Inst. C.E.

This portion of the permanent way of railways was shown to require great attention, not only on account of the cost, but for the more important reason, the safety of the travelling public, which was seriously jeopardized by any want of care in the maintenance; it was, therefore, most desirable to insure, in the construction of all parts of the permanent way, the greatest amount of efficiency, combined with the largest ultimate economy.

This remark was more peculiarly applicable to the construction of switches and crossings, as they not only formed important features in the system, but they were originally expensive, and were liable to rapid destruction under heavy traffic, whilst corresponding injury was done to the rolling stock, by their being in a bad state of repair

With these views, many attempts had been made to introduce improvements, which had been more or less successful. Among those chiefly deserving attention were, Wild's system of housing the tongue-rail of the switch beneath the top flange of the fixed rail; Parsons' solid point rail switches and crossings; Baynes' switch, with its deep tongue-rail, intended to clear the sliding chairs of any dirt lodging upon them; and Carr's crossing, in which pieces of metal were welded under those portions of the upper table of the wing and point rails, most exposed to abrasion and compression. These, although advantageous modifications, were still susceptible of improvement, particularly in the weakest parts, which were the outer rails of the switches, and the wing rails of the crossings, in the line where the outer edge of the wheels crossed them in a diagonal direction. The severe blows to which these parts were exposed, were caused, in a great measure, by the undulation of the rails, during the passage of the weight, which was alternately sustained by the point rail and the outer rail. The movement, or shifting of the relative positions of the various parts of a switch, or crossing, resulting from these causes, was most injurious, as the least subsidence of the rail, on which the wheel rested, caused a severe concussion, when the outer edge of the tyre first struck, or mounted the adjoining rail, whilst crossing it diagonally. This concussion was simultaneously both lateral and vertical, and being given at a high velocity, and the springs not being able to relieve the axles, wheels, and other parts of the engines and carriages, general injury was occasioned; and to this cause might be attributed the greatest number of accidents arising from fractures of the rolling stock.

A great defect in ordinary switches, was the lateral weakness of the tongue-rail, which was sometimes sprung to such an extent by the leading wheel, as to open the point sufficiently for the next wheel to run on to the wrong line, and cause serious accidents.

The importance of attention to these portions of the permanent way, would be better appreciated by alluding to the quantity in use throughout the kingdom. This might be inferred, from the fact of there being in the London Station of the Great Northern Railway, upwards of five hundred sets of points and crossings. In certain stations, under very heavy and constant traffic, and with certain qualities of ballast, the outer rails of some of the switches and crossings were frequently worn out in six weeks, by the cutting action of the outer edge of the wheels. It was, however, generally found that a good, sound, and well-drained foundation tended materially to reduce this destructive action.

In the case of a tyre, worn hollow, passing over a switch, or crossing, the wheel was actually lifted off the inner rail, and carried on the adjoining rail, resting only upon the outer edge of the tyre, at which moment the concussion occurred, which produced the lateral strain upon the wheel, and the crushing action which channelled out the rail in the path of the outer edge of the tyre.

A want of rigidity was severely felt in switches and crossings, as in the main portion of the permanent way; and hence the advantages of "fishing" the ends of the rails, so as to secure continuous resistance to the impact of the wheels, and to the insistent weight of passing loads.

Considerable experience and careful observations of these, and other minor defects, induced the introduction, by the author, of a switch with a projecting piece, rolled upon the tongue-rail, for supporting the flange of the wheel, during its transit over the spot; the surface of the projecting piece being sunk to such a depth below the top of the rail, as to correspond with the depth of the flange of a new wheel, which would therefore take a bearing on both the rail and the projecting piece simultaneously. When a tyre was worn hollow, the outer, or cutting edge was thus borne up nearly in its original position, and was prevented from cutting into the outer, or adjoining rail, which it crossed in a diagonal direction. The surface of the projecting piece was so depressed at its extremity, as to receive the flange of the tyre very gradually, and thus to avoid any concussion; whilst the outer rail was protected from injury, and considerable lateral stiffness was imparted to the tongue-rail. This system had been proved to be very successful practically, and appeared to obviate most of the defects of previous switches and crossings.

The advantages of having extra connecting rods at all meeting points, at junctions, or stations on the main line, were insisted on; and it was recommended, that they should be fastened by a split-key, rather than by a screw and nut.

The frequent fractures of the cast-iron hinge chairs of switches had induced the successful introduction of wrought iron for the purpose; the hinge being so constructed as to render it almost as perfect as a "fished" joint, and all risk of breakage was obviated.

The introduction of a filling piece, or flange bearer, between the wing and point rails of a crossing, was also shown to be an improvement, tending to prevent concussion, whilst it acted as a "fishing" plate, for the entire crossing, which was rendered as rigid

as a beam. The importance of this continuous rigidity was evident, from the cessation of the alternate movements between the wing and point rails, which were usual on the passage of trains, and which caused so much mischief.

The "fishing" plates were rolled alike on both surfaces, for the purpose of being reversed; the substitution of wrought, for cast-iron chairs, insured immunity from fracture and ultimate economy; wooden keys were entirely dispensed with; and after severe trial under very heavy traffic on the Great Northern Railway, particularly in positions where the outer rails had been previously destroyed, in six weeks, or two months, the switches and crossings, introduced by the author, had stood the test of long and heavy wear, without exhibiting any symptoms of failure, and the experience already acquired of their properties induced complete confidence in the advantages they presented.

PROTECTION OF THE NEW PALACE AT WESTMINSTER FROM LIGHTNING.

In the published Estimates of Civil Services (chap. 1) for the year 1855-6 there is a charge of £2,314, for works necessary for protecting the New Houses of Parliament from injury by lightning, to which an explanatory report is appended by Sir W. Snow Harris. In a notice of this subject the *Times*, of Monday last, has the following remarks:

Sir Snow Harris, in his present report, once more refutes the fallacy of the vulgar and unphilosophical assumption that lightning rods "attract" the lightning, and so act as efficient safeguards. It is proved by a most extensive induction of facts, and a large generalization in the application of metallic conductors, that metallic substances have not exclusively in themselves any more attractive influence for the agency of lightning than other kinds of common matter, but that, on the contrary, by confining and restraining the electrical discharge within a very narrow limit, the application of a small rod or wire of metal to a given portion of a building is, in reality, highly objectionable. Besides, the application of an ordinary lightning rod is of a very partial character; it has small electrical capacity, and is very often knocked to pieces by heavy discharges of lightning. To mention only a few recent instances out of several adduced by Sir Snow,—last June, Ealing church was struck by lightning, the small conductor attached to the tower was partially fused, and damage ensued. So again, in July, a church at Astbury was struck, and the small conductor fused in several places, the discharge dividing on the body of the church, and displacing and shivering several stones. In Her Majesty's navy conductors of this description have been repeatedly knocked in pieces by lightning. To secure such a building as the New Palace at Westminster against lightning, Sir Snow considers it requisite to complete the general conductibility of the whole mass, and so bring it into that passive or non-resisting state which it would assume in respect of the electrical discharge, suppposing the whole were a complete mass of metal; by which means a discharge of lightning in striking upon any given point of the building would have, through the instrumentality of capacious electrical conductors, unlimited room for expansion, upon the surface of the earth, in all directions to which, by a law of nature, the discharge is determined. "In fact," to quote from the text of the report, "what is called lightning is the evidence of some occult power of nature, forcing a path through substances which offer greater or less resistance to its progress; such, *e.g.*, among the former, as atmospheric air, vitreous and resinous bodies, dry vegetable substances, and such like. In the case of such bodies a powerful evolution of light and heat attends its course, together with irresistible expansive and disruptive force, by which the most solid and compact structures are rent asunder; whereas, in finding a path through substances which offer comparatively little resistance to its course, this explosive form of action, which we call lightning, becomes transformed into a harmless and unseen current; hence, the great protective influence of a capacious and general system of conduction, such as that just adverted to, which does not restrict the discharge to a given partial and narrow path, but is so circumstanced that lightning striking anywhere upon buildings cannot enter upon any circuit of which the large capacious lines of conduction do not form a part." Such are the views and principles on which Sir Snow Harris ventures to recommend his system of metallic conductors to be applied and carried out in the great mass of the buildings constituting the new Palace at Westminster, and which, he feels assured, will effectually secure those buildings from the effects of lightning both for the present and for all future time. Now, the general surface of the roofs of the palace being iron coated with zinc, and connected with the earth by iron waterpipes in very many places, fulfils, to a great extent, one of the important conditions of the general conduction required, and thus the large mass of the roofing may be deemed as virtually a portion of the earth's surface

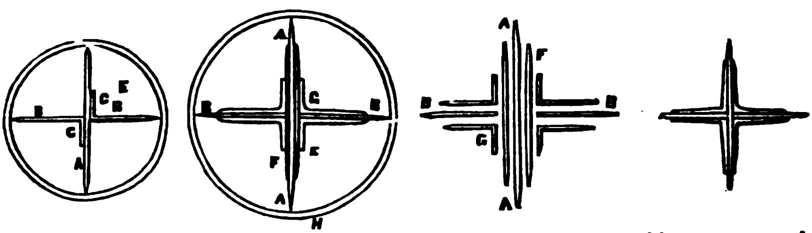
electrically considered. It is only necessary, therefore, to provide for the several portions of the building above the general level of the roofs, and to make up, by capacious conductors of copper, for the comparatively low-conducting power of the roofs and the cast-iron pipes which connect them with the earth. The elegant central tower, for instance, is 150 feet above the general level of the roofs of the palace; and Sir Snow recommends that a capacious conductor of copper tube of two inches diameter, and at least one-eighth of an inch thick, be fixed within the upper part of the tower, in its south-west angle, from the large copper terminal which surmounts it to the level of the roofs of the buildings generally; that this tubing should be effectually secured at the joints over solid screw plugs and coupling-pieces, and secured to the masonry by metallic staples. At the junction of the tower with the roofs Sir Snow would recommend this copper tubing, after being well connected with the metals of the roof, to be continued externally to the earth in as straight a course as possible, and there terminated by one or two projecting branches of solid copper rod. The reason assigned for continuing the copper conductor as a whole into the earth (the soil of which should consist of carbonized matter as far as possible), instead of terminating it in the metals of the roof, is this—viz., that the electrical discharge would have a line of the same conducting material throughout, and not have to leave a high for a lower conducting power. Throughout the entire height of the Victoria and Clock Towers (300 feet from the ground) Sir Snow recommends that a copper band of conduction, similar to the conductors applied in Her Majesty's navy, five inches wide and 3-16ths of an inch thick, be fixed and secured to the walls; the band to be properly connected with the metal bodies of the roofs generally, and also with the metal rail of the staircase within each tower. The north and south towers in the centre of the portion of the river front will also require special protection, by attaching bands of sheet copper from the vanes to the roofing beneath, and from these conductors constructing an independent line of the same metal, to be continued to the earth. The north and south wing towers of the river front should be treated similarly. In the ventilating shaft of the House of Commons, where a coke fire is generally in operation, it is recommended that a tubular conductor should be fixed on the east side of the shaft, and connected with the metals of the roof, as, otherwise, the ascending rarefied column of warm air might determine the course of a stroke of lightning in the direction of the shaft. Lastly, the ornamental turrets and pinnacles of St. Stephen's Porch should be protected by small bands of sheet copper, two inches wide, and one-eighth of an inch thick, neatly attached to them, and placed in connection with the metals of the roof below. These recommendations are the result of very serious and attentive deliberation, and Sir Snow conscientiously believes that they are absolutely requisite. The instances of various church spires struck by lightning and ruined are adduced in support of his views. It is worthy of remark, as illustrative of the deplorable ignorance which exists, that on the spire of Christchurch, at Doncaster (struck in the year 1836), a ball of glass had been placed, under the notion that glass, because a non-conductor, is also a repellent of lightning.

M'GAVIN'S PATENT MASTS AND SPARS.

(Patent dated March 31, 1853.)

Mr. R. M'Gavin, of Glasgow, has patented a method of combining iron or wood

Fig. 1. Fig. 2. Fig. 3. Fig. 4.



in the manufacture of masts and spars, for the purpose of reducing their first cost, weight, and bulk.

Fig. 1 of the accompanying engravings is a horizontal section of a ship's mast or yard, constructed with his improvements; fig. 2 shows a method of applying additional plates when required; fig. 3 is a sketch, in which

the plates shown in fig. 2 are slightly separated; and fig. 4 is another modification of the same principle.

"In constructing a mast in this way," says the inventor, "a long main central plate, A, is first rolled and prepared to suit the required dimensions of the mast, the width of the metal being considerably less than the diameter of the finished mast; B B are the two additional side pieces necessary to make up the intended cruciform section of this wrought-iron core. Each of these pieces, B, has an angle, C, rolled along one edge, so that when the two pieces are disposed on opposite sides of and at right angles to the main plate, A, rivets can be passed through the angle pieces, B, and through the main plate, along the centre line of the latter, to combine the three pieces into one frame-piece or core. The four spaces or divisions, D, are now filled up with wood, E, so as to form a mast of completely solid cross section. The wood so filled in is not relied upon as a direct means of supporting strength, its essential office being the filling up of the divisional spaces to form a solid mass, and prevent the buckling of the plates of the core; for, as the presence of a solid body between each two divisional pieces or wings, A B, prevents either of such wings from swerving out of its normal plane, it follows that each plate, A B, is disposed in the best possible manner to meet lateral strains; that is to say, all lateral strain is directed through each plate in a line parallel with the plane of such plate where there is the greatest resisting depth of metal. Hence the filling-in wood may be in short small pieces, as, provided the wood is sound, such short pieces, when well joined by marine glue or otherwise, so as to leave no objectionable openings along their contact surfaces, are quite as efficient as longer ones. Various means may be adopted for effecting the junction of the constituent pieces of the wrought-iron core. For example, a double angle or T-edge may be rolled or formed on the edge of each of the side pieces, instead of the single angle or flange; or the pieces may be left entirely without flanges, separate angle-irons being riveted or attached to one edge of each separate side piece, such angle irons being then riveted by their other free flange to the main plate, as represented in fig. 4. Where very great strength is required, the core of the mast or spar is constructed as represented in figs. 2 and 3, the central plate, A, having narrower plates, F, riveted to each side of it, together with the angled plates, G, between which the side plates, B, are riveted."

In making a yard, the longitudinal central portions of the plates, A B, are made of a superior width, so as the better to resist lateral strain; or, instead of this widening of the metal, its thickness may be increased, either rolled in the plates, or made by the addition of separate tapered pieces. "It will be obvious," says Mr. M'Gavin, "to the practical man that this system of constructing masts and spars is suitable for a variety of works, and especially for the jibs of cranes, where a combined longitudinal and lateral resistance is required. The filling-in wood may be made either to fill up the divisional spaces entirely or partially; but, when filled up throughout, as in fig. 1, metal hoops, H, are passed upon the structure, to bind the whole well together."

MACKAY'S PATENT APPARATUS FOR PROPELLING VESSELS.

(Patent dated July 29, 1853.)

Mr. J. Mackay, of Aigburth, near Liverpool, has patented an arrangement of propelling apparatus, which is intended to prevent the loss of power occasioned by the slip of the common screw propeller, and also to avoid the loss occasioned by the dead resistance which the boss and arms of submerged propellers present to the water during the onward progress of the vessel.

In carrying out this invention Mr. Mackay forms a kind of double-threaded screw by lapping round a boss carried by a propeller shaft, two segment blades formed out of a circular disc cut into two equal parts, which blades are set at an angle to each other, their lines of divergence crossing in the axis of the shaft that carries them. The vessel to the stern of which the improved propeller is to be fitted is provided *with a horizontal* tubular projection, through which the propeller shaft runs, and against which the boss of the propeller abuts, the object being to displace the water in front of the boss of the propeller.*

In the accompanying engravings, fig. 1 is a partial side elevation of a ship fitted with these improvements, and fig. 2 represents the stern end of the vessel. *a* is the boss, and *b b* are the blades of the propeller. *c* is the propeller shaft, connected in the usual manner to the motive power machinery, and running through a tubular projection, *d d*, having a diameter corresponding to the diameter of the boss, *a*. This projection, *d*, it will be seen is parallel or nearly so to the keel, and falls away, and is

* This horizontal tubular projection placed before the boss of the propeller is the characteristic feature of Mr. Macallister's invention, of which a description was promised on p. 369, of No. 1591.

lost in the swell of the hull of the vessel. It is thus virtually a forward prolongation of the boss of the propeller, and prevents the water which is displaced by the hull of the vessel from closing in and pressing upon the forward end of the boss, *a*.

Fig. 1.

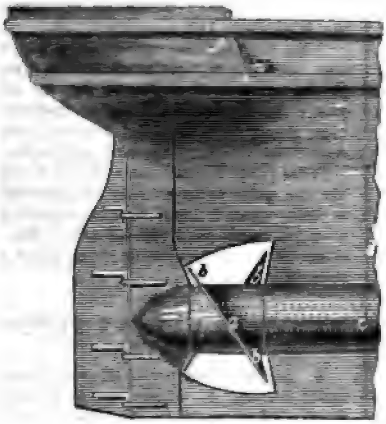
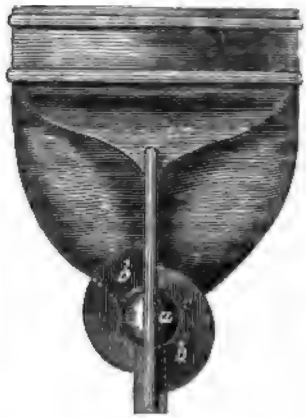
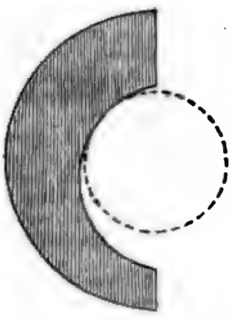


Fig. 2.



"In forming the blades of my improved propeller," says the inventor, "I have said that I employ two semicircular plates. These blades I prefer to place eccentrically upon their boss, as I thereby cause the forward end of the propeller to describe a circle of a larger diameter than the hinder end, the effect of which arrangement is that the propelling power of each blade will be great immediately it enters the water, and that the lift of back water will be inconsiderable. The diagram, fig. 3, shows the pattern of the kind of blade which I prefer to employ, as laid out flat, with its outer edge concentric with the boss which is to carry it. The inner edge of the blade is formed by making in the semicircular plate (from which the blade is supposed to be formed) an eccentric circular or curved cut. When, therefore, a blade formed after this pattern is applied to the boss so that its inner edge lies in contact with the cylindrical surface of the boss, the blade will take the configuration shown at fig. 2.

Fig. 3.



AMERICAN TELEGRAPHS.

Mr. T. P. Shaeffner, the President of the American Confederated Telegraph Companies, has published in the New York *Telegraph Companion*, of which he is the Editor, the results of his last year's visit to this country and the continent, the object of which was to obtain from the Danish and Russian Governments certain concessions necessary to the establishment of submarine telegraphic communication between America and Europe. We can ourselves bear testimony to the zeal with which Mr. Shaeffner devoted himself, during his tour, to the acquisition of full and accurate information on all subjects relating to the operation of the telegraph in this country, and we have but little doubt that his observations will lead to beneficial changes in the telegraphs of the United States.

The following remarks, taken from his paper, display considerable honesty, and show us that the Americans have much to do towards perfecting their system, which has been so highly held up by some English writers for our imitation.

"The winds and storms are great enemies to the American lines. We have all our telegraphs built on poles. Trees are blown across our wires, and the line is either broken or buried in the earth. Not-

withstanding the daily troubles occurring from the storms, yet the atmospheric difficulties are the most powerful and annoying. With our practical and money-making ideas, we have not properly studied this difficult problem. If they had the same difficulties to encounter in Europe, we have no doubt some remedy would have long since been discovered. In America the dollar controls everything. Success in money makes the man. It is thus that many men become great, while others of merit are passed unnoticed. Our people look for the dividends immediately, and unless they are large and often, dissatisfaction is manifested. In making these remarks, we may add, that while the American people do not apply the necessary theory and scientific talent in the conducting of our telegraphs, we think the European lines do not have the appliances of practical facilities equal to the American. They are in in advance of us in theory. We are before them in practicabilities for the time being. Theirs are substantial, and made for years; while many of ours are built and rotted within a year. Upon this subject we purpose speaking to our American people in the language of figures, ere long. Daily observation tells us that we must change our mode of construction."

It is worthy of remark that Mr. Shaeffner attaches much importance, and gives great prominence, to the system of the Magnetic Telegraph Company, and speaks of its officers, in the following passage, in terms which it is not the custom of our cousins to employ, when discoursing of English science and scientific men.

"On arriving in England, we soon found that there was much to be learned, and we spared no pains in procuring all the information possible. In the present number, we give the answers of Mr. Charles T. Bright, engineer of the English and Irish Magnetic Telegraph Company, and also the answers given by Mr. Edward B. Bright, secretary to the same company. These gentlemen did not give their views with the expectation of their publication, but we find them so exceedingly interesting, that we take the responsibility of publishing them for the benefit of others.

"Messrs. Bright have charge of the Company's lines on which they are engaged. Their manner of business, and management generally, compare favourably with the best governed lines of any country. They are gentlemen, well educated, and they understand their business thoroughly. We regard them as experts in all departments of telegraphing, and worthy of the most elevated consideration. We feel under many obligations to the Messrs. Bright for their many attentions in presenting us with so much valuable information, and we assure them that their presence in America would be received with much pleasure and congratulation.

"At the earliest opportunity we shall feel pleased to reciprocate the favours shown us; and if it should be out of our power to return them equal favours, we hope it may fall to the lot of some generous American to square the account for us."

It may be well to state that Mr. Shaeffner was quite successful in his applications to foreign courts, and is now earnestly exerting himself in order to effect the construction of transatlantic telegraphic communication.

FENTON'S PATENT SAFETY-VALVES.

A paper descriptive of the improved safety-valves, of which we published an illustrated account in No. 1634, (vol. lxi, page 529,) was recently read at the Institution of Mechanical Engineers, Birmingham, by the inventor, Mr. James Fenton, of Leeds.

We are pleased to find that after the reading of the paper, (which the article above referred to has rendered it unnecessary for us to publish), the high opinion we expressed of Mr. Fenton's invention was amply confirmed by the testimony of several eminent engineers.

Mr. W. Fairbairn, who presided, remarked that the proposed arrangement of valve appeared to have much ingenuity and merit; the double lock-up valve was particularly simple and complete, both the valves being locked in effect, but still free to move and blow off.

Mr. Fenton said it was found a practical advantage of much importance that the lock-up spring was adjusted to the required limit of pressure by the open spring balance alone; thus entirely avoiding the uncertainty of pressure adjustment that existed in many lock-up springs, arising from difficulty in measuring the pressure accurately when adjusted, and from change in the elasticity of the spring during use. In the new arrangement this pressure was continually checked by the open spring balance, and could be readily tested with certainty, by screwing down the spring balance until the lever began to lift up the locked spring by acting upon the front valve as a fulcrum; the arrangement formed a simple and convenient mode of obtaining the advantage of a lock-up safety-valve with the ordinary pair of open valves, without interfering with their action.

Mr. Fairbairn asked whether any other

f spring, such as a flat volute spring, en tried for the lock-up spring; he t the ordinary spiral spring would ly not be found the best for the pur- s it did not stand so well under very pressure.

Fenton replied, that a trial of some springs was expected to be made , but there had been found a diffi- t first in getting them made suitable purpose; the spiral spring that was had however been found to stand torily in the valves that were at and when a greater pressure was d than could be well obtained with spring, a second spiral spring was in the interior of the first one, with- cupying more space, or altering the asing.

Fothergill had known the ordinary valves stick in many cases in the of the levers, arising from dirt, and accuracy in the fitting, and conse- imperfection in the bearing of the moving parts, causing oblique strain ction; but the new valve of Mr. entirely avoided this cause, and the ment was certainly very perfect in g always a correct action of all the

May inquired whether any particular had been adopted for getting up the of the safety-valves. Ball-valves e made to fit very accurately; he bered a remarkably perfect specimen s made by an old foreman of Messrs. 's,—it was a glass sphere dropping steel plate with a thin knife-edge the aperture, and it fitted perfectly it, although the surface of contact exceedingly minute.

Fenton replied that the best plan he r the purpose was that used by Mr. ottom, for getting up the ordinary ves of pumps; two cast iron cups mployed, revolving in opposite direc- ne inverted over the other, and the s ground between them with emery. st of getting up the pump-valves believed, very small by this plan, out 1½d. per ball, and they were ery perfect.

Adams remarked that the common f grinding children's marbles was a instance of simplicity in machinery; ber of stone chips, broken to size, t together in a tin box and fastened im of a water-mill wheel, and there rind themselves into shape.

Fairbairn inquired what was the re- pense of the new safety-valves, com- ith that of the ordinary ones?

Fenton replied that the single valves out the same cost as the ordinary ones, but the double valves combined under one lever, were about one-third less cost than a corresponding pair of ordinary valves; the cost was about £13 for the double valve, and £10 for the single one, including the spring balances.

Mr. Fairbairn thought the plan was an ingenious improvement to prevent sticking of the valves, and the consequent risk of accident, by insuring a constant free action; and it was a very simple and efficient arrangement for obtaining a lock-up valve.

He proposed a vote of thanks to Mr. Fenton, which was passed.

Mensuration Made Easy; or, the Decimal System for the Million, with its Application to the Daily Employments of the Artizan and Mechanic. By Charles Hoare. Third Thousand, with Important Additions. London: Effingham Wilson, 11, Royal Exchange.

A great want has long been felt, according to Mr. Hoare, of an elementary work fitted to impart to the artizan and mechanic knowledge so necessary as that of decimal arithmetic, and its applications to the various little problems which they daily meet with. To supply this want the present work has been written, and an inspection of it is "courteously, but fearlessly, solicited." Notwithstanding the confidence of the author, and the fact that the treatise has passed into a third edition, and the further fact that it has been noticed favourably by certain Head Masters of Schools, and by Morning Papers, we are bound to say that it is a production which we cannot recommend, and which its many demerits incline us to treat severely.

Its very title-page ought to be viewed as a caution against it, when it is discovered that the whole work, including several tables, is comprised in eighty-four pages much smaller than our own, and in type very much larger than that which the reader is now perusing; for it is impossible that either Mensuration could be made easy, or a Decimal System be presented to the Million, in so small a compass. But on a closer examination we find it is to be condemned because a very bad use has been made, in many places, of what little space is allotted to his task by the author. In *making* the treatise he seems to have experienced some difficulty, and one might almost be certain that a long and pretentious preface had been written before the work itself was commenced, but was subsequently found too long to appear *in propriâ formâ*, and was therefore broken up and dispersed through the succeeding pages, in

order to avoid wasting the labour of the writer.

Passing by the loose and ungrammatical style in which much of the book is written, we remark that definitions and principles are often vaguely and incorrectly stated. As examples of this the following may be given:

"A cylinder is a round prism, the ends being circular, as in a round canister."

"A cone is a round pyramid, the base being circular."

"Similar forms are in the proportion to each other of the squares of their like sides or diameters."

Any geometrician will at once discover the grave defects of these sentences, and we might increase the number of such extracts greatly.

In a fragment of the preface which appears on page 24, the author calls Mensuration an exact science: it certainly is not very *exact* in his hands; nor, indeed, is it properly a *science* at all, but an *art*, as it is termed by Mr. Hoare himself on page 29.

Moreover, the omissions visible in the work are as numerous as the faults. While there is nothing in it which is not done better elsewhere, there are some things of the greatest importance excluded altogether. One remarkable instance is this:—the operation of extracting the square root of a quantity is avoided; hence the pupil is enabled to find neither the third side of a triangle from the other two, nor the area of a triangle when the lengths of its three sides are given, nor the area of a segment of a circle when the chord and versed sine are given, and so on.

In short, the probability is that the only persons who would understand the book are those who could write a much better one themselves. We regret having to speak so unfavourably of Mr. Hoare's production, but it is pretty plain to us that if the scientific portion of the press does not pronounce faithfully on such treatises, the senseless commendations of newspapers and other unqualified organs will beget and foster a spurious species of literature, which will tend only to confound those of the working classes who make attempts at self-culture, and give them a distaste for studies which, properly directed, cannot fail to prove sources of pleasure and benefit.

PROFESSOR CALLAN ON THE NEW MAYNOOTH SINGLE-FLUID BATTERY.

To the Editor of the Mechanics' Magazine.

SIR,—I have no intention of entering into a discussion on the merits of the Maynooth single-fluid battery. I have neither inclination, nor time, nor health, for carrying on a controversy on that or any other subject. But I think it right to say something in reply to the letter of "A Galvanist," published in your journal of the 14th of this month.

The writer of the letter commences by saying or implying that the Maynooth single-fluid battery is not a new one. I do not agree with him; on the contrary, I feel perfectly certain that it is a new battery, because the exciting fluid in the Maynooth single-fluid battery was never used before in any single-fluid battery, especially when the negative element was cast-iron. The voltaic power of a battery depends on the solid elements employed, which are generally zinc and a negative metal, or zinc and carbon, and the fluid or fluids by which they are excited. A battery, then, is a new one when a solid element is employed which was never used before, or when two solid elements are excited by a fluid or fluids never used in any former battery, or when they are excited by a fluid by which they were never before excited, though that fluid had been used for exciting other elements. Thus Bunsen's battery was a new one, though the solid elements, as well as the fluids, had been used before; but the carbon was never excited in any former battery by nitric acid. Thus, also, for the same reason, the cast-iron nitric acid battery, commonly called the Maynooth battery, was a new one, because cast-iron was never before excited by nitric acid. The Maynooth single-fluid battery is described in the *Philosophical Magazine*, page 264, as consisting of cast-iron and amalgamated zinc excited by any of the following fluids:—"First, undiluted muriatic acid, or muriatic acid diluted with a small quantity of water: secondly, muriatic and sulphuric acid together, diluted with a quantity of water a little more than twice as great, by measure, as that of the sulphuric acid; thirdly, sulphuric acid diluted with about twice its bulk of water, or the strongest sulphuric acid made from sulphur, diluted with three times its bulk of water; fourthly, sulphuric acid mixed with three times its bulk of a strong solution of common salt, or the strongest sulphuric acid made from sulphur, mixed with three and three-fourths its bulk of the same solution." I feel confident that any of these fluids was never used before in any single-fluid battery, especially when cast-iron was the negative element; and until I find it stated in some publication that at least one of these fluids was used in exciting a cast-iron single-fluid battery, I think I can fairly hold that the Maynooth single-fluid battery is a new one.

Your correspondent says that "great stress is laid on the necessity of insuring proximity of the plates." I am not aware of having

laid great stress on this necessity. I believe I merely represented that the single-fluid battery has this great advantage over the nitric acid batteries—that the distance between the positive and negative elements in the former may be diminished without limit, whilst this distance in the latter cannot be less than three-eighths of an inch.

In the following paragraph he says that the results of my experiments with the galvanometer are fallacious. I do not consider them fallacious, although some persons might draw an erroneous inference from them. It would certainly be an error to conclude from them that the intensity of the new battery is greater than that of the nitric acid batteries. I have not drawn such a conclusion from them: this is evident from the following passage in my paper in the *Philosophical Magazine.* "The greatest length of the flame between the coke points (when ignited by seventy 4-inch cells of the new battery) appeared to me to be less than it would be with a nitric acid battery of seventy 4-inch cells. Hence I infer that the intensity of the single-fluid battery is less than that of the nitric acid battery although the quantity of electricity is much greater."—Page 272. I believe this passage in which I say that the intensity of the new battery is less than that of the nitric acid battery, is the only one in which the intensities of the two batteries are compared. It is evident, then, that I never intended to induce others to believe that the intensity of the new battery was greater than that of the nitric acid batteries. From my experiments with the galvanometer, I merely inferred that the new battery is more powerful than the nitric acid batteries, because the voltaic current produced by the former is more powerful than that which is produced by the latter. This inference appears to me to be a fair one, not calculated to mislead others, especially as I described the galvanometer I used, which was evidently made for comparing currents of great quantity rather than currents of great intensity.

After saying that "the double fluid deflected the needle 82° on one side, whereas when the current from the single fluid was passed in the opposite direction it not only overcame the current from the double, but deflected the needle 72° on the opposite side," your correspondent adds: "The fact is, the effect could not be otherwise, seeing the conditions of the galvanometer coil relatively to the conditions of each of the two batteries." I can assure him that were any other battery, except the Maynooth single-fluid battery, compared by means of the same galvanometer coil which I used, with the nitric acid batteries, the effect would be quite otherwise; and that the current of any of the other batteries so far from overcoming the current of a nitric acid battery, and producing an opposite deflection of 72° would not overcome one half of the current from a nitric acid battery.

Your correspondent appears to think that, in order to form a correct estimate of the relative powers of the single-fluid and the nitric acid batteries, the former should be used with all the disadvantages of the latter. In this I do not agree with him. I think that the two batteries should be compared with each other, each acting in the most favourable circumstances, or working with its greatest power. It was in this way I compared their powers by means of the galvanometer. I have compared the power of some of the common batteries with that of the new single-fluid battery, by means of the same galvanometer, and have found that in order to produce the deflection of the needle caused by a pair of 4-inch plates of the new battery, a pair nearly twenty times as large as that of the other batteries would be required.

In the last paragraph your correspondent says that the protection necessary for the inactive part of the cast-iron shows that there must be great local action, and consequently considerable changes in the fluids, which render the action of the battery of such short duration as to make it unfit for little more than a striking experiment in the lecture-room. If the inactive part of the cast-iron be not protected, there will certainly be a good deal of local action on that part. But is your correspondent certain that the action on the active part of the iron, or on that part of it which is opposite the zinc, is merely local action, or that the action on that part of the iron does not produce in the battery an amount of galvanic power proportionate to the action? I am inclined to think that the action of the exciting fluid on the active part of the iron contributes to the galvanic power of the battery; and that the galvanic power of the Maynooth single-fluid battery is proportional not to the action on the zinc alone, as in the nitric acid batteries, but to the sum of the actions on the iron and zinc, and that therefore the expense arising from the consumption of metal will be less in the single-fluid battery than in the nitric acid batteries; for zinc is more than twice as dear as cast-iron. See my paper in the *Philosophical Magazine*, page 268.

With regard to the conclusion which your correspondent draws from the action of the fluid on the cast-iron, viz., that the action of the battery must be of short duration,

although it is a very natural one, it is not warranted by experiment. This is evident from the following brief account contained in my paper of the results of a trial of 48 cells of the new battery by two eminent scientific men:—"The Rev. Dr. Robinson and Mr. Bengin, to whom I mentioned the various fluids which I found to excite cast-iron and zinc so powerfully, have lately tried a cast-iron battery of 48 cells, charged with one part of strong sulphuric acid and three of a pretty strong solution of common salt. The distance between the zinc and iron was nearly one-eighth of an inch. The quantity of fluid used in filling the battery was, I think, a gallon and a half, in which there were about three pints, or about seven or eight pounds of sulphuric acid. With this battery they had a brilliant coke light, sufficiently steady to enable them to make observations on the light with the prism and polariscope; also lights produced by the ignition of various metallic points, on which lights similar observations were made. Various other experiments were made: they commenced at one o'clock, and were not given up till nine. There were, of course, several interruptions, during each of which the fluid was, by a very ingenious contrivance, poured off the metallic plates. During the eight hours the experiments lasted, the battery was in constant action at least three and a half or four hours. At the end of the experiments the two metals were quite clean, and there was no sensible diminution of voltaic power. The results of this trial show that a cast-iron battery excited by one part of sulphuric acid and three of a solution of common salt, is very powerful, extremely constant in its action, and most economical in use. The sulphuric acid employed was made not from pyrites, but from sulphur. I purchase, at the vitriol works of Messrs. Boyd, Belfast, sulphuric acid made in the same way and of the same strength, at the rate of 8s. 6d. per cwt., or for less than one penny per pound. Hence, at the price at which sulphuric acid is sold by Messrs. Boyd, the cost of the exciting fluid, for eight hours, scarcely exceeded eight pence."—*Phil. Mag.*, p. 269.

Although I have not yet made an exact comparison between the intensity of the single fluid battery and that of the nitric acid battery, I have described in the *Phil. Mag.* one experiment in proof of the great intensity of the single-fluid battery. I stated that "in using for the electric light a cast-iron battery, excited by about one part of sulphuric acid, one of muriatic, and two of water, I made an experiment which proves the great intensity of this battery. After the battery had been at work for about three quarters of an hour, I emptied two of the cells at one end. Whilst they were empty, the ends of the battery were connected with a pair of coke points. The voltaic current passed through the two empty cells, ignited the coke points, and produced a brilliant light. The voltaic current had no other means of passing to the coke than through the damp pieces of wood which separated the zinc plates from the cast-iron cells, or through the wooden frames in which the two empty cells were placed."—Page 268. I had a still more striking proof of the intensity of the new battery in trying 186 cells, on last Friday week. When all the cells but three were filled, I brought a pair of coke points connected with the opposite ends of the battery into contact with each other, under water. As soon as they were put in contact with each other, a spark passed between the metals in the empty cells, and afterwards a flame, caused, I suppose, by the combustion of the zinc and cast-iron. The metals were separated from each other by pieces of dry wood. Had your correspondent witnessed the action of the several series of the new battery which I tried since its discovery, some of which are described in the *Phil. Mag.*, he certainly would never have entertained the opinions he has expressed regarding the Maynooth single-fluid battery.

Your correspondent says, without giving any reason for the assertion, that practice will prove that Daniell's battery is preferable to my battery, in which cast-iron is substituted for the copper used in Daniell's battery. In my paper in the *Phil. Mag.*, I have proved that my battery is more powerful and more economical than Daniell's. As your correspondent does not impugn my proof, I think it unnecessary to repeat it. He also says that there is nothing new in this battery. I think otherwise; for this battery differs just as much from Daniell's, as Bunsen's does from Grove's. In Daniell's, copper is excited by a solution of sulphate of copper; in mine, cast-iron is excited by the same solution. In Grove's, platina is excited by nitric acid; in Bunsen's, carbon is excited by the same acid.

I am, Sir, yours, &c.,

N. CALLAN.

Maynooth College, April 21, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

*** No. 2142, an abstract of which appeared on page 381 of our last Number among the "Provisional Specifications not Proceeded with," has subsequently been completed, and the final specification of it filed, the Lord Chancellor having granted an extension of the time allowed for filing it, in consequence of the delay, by which the

ɪe was exceeded, having arisen in ffice.

JOHN MACMILLAN, of Manchester, engineer. *Improvements in apparatus for preparing, spinning, cotton and other fibrous materials.* d October 5, 1854. (No. 2147.) ntion "relates to such machines ig, spinning and doubling as are th revolving spindles, the bear- ich are variable as regards their steadying effect, and consists in velocity to the said spindles, so them at an accelerated rate as they are more effectually d *vice versâ.*"

, FRANÇOIS, of Paris, France, n. *Certain improvements in cir-* Patent dated October 5, 1854.

ation consists—1. In such me- rangements of a circular loom t threads are made to cross the s by means of a continuous cir- n. 2. In a system of pass-thread h or without a shuttle, and act- ndless or intermittent weft. 3. truction of a weft needle carrier colours and form the design. 4. eedle-knife carrier to cut plain ternate parts of velvet on tissue. n mechanical arrangements for g a twisting hook.

ANDREW, of Princes-street, Mid- engineer. *An improved safety- paratus for mines.* Patent dated 1854. (No. 2149.)

rovement consists in the appli- lastic stays, or elastic angular rods, to support the cage in or materials are raised from or a mine or other underground arranged that in the event of g of the rope or chain they scent of the car or other means ce.

S, WILLIAM, of Hampson Mill, Lancaster, bleacher. *Improve- achinery for beetling cotton and* . Patent dated October 7, 1854.

vention consists of an improved of machinery for beetling cot- r fabrics which are wound upon subjected to the action of two ters acting alternately upon the

ROBERT WAY, of Fogginton, neer. *Improvements in machinery facture of bricks and tiles.* Pa- October 7, 1854. (No. 2154.)

. 1. The construction of ma- the manufacture of bricks and s employment of cylinders or chambers provided with pugging knives and pressing bars, in combination with connected sets of moulds caused to move to and fro beneath the said cylinders or chambers. 2. A mode of arranging the cylinders or chambers in pairs around the centre of the machine, each one of every pair of cylinders being on opposite sides thereof, and a mode of causing the moulds to move to and fro beneath such pairs of cylinders, so that one set of moulds may be filled while the other set is being discharged. 3. A mode of causing the moulds to move to and fro beneath the cylinders or chambers when arranged otherwise than in pairs. 4. A mode of constructing the cylinders or chambers with a partial false bottom. 5. The employment of pressing bars in the cylinders or chambers. 6. The combination of several moulds in one mould frame. 7. Certain modes of constructing and working the receiving tables.

SELBY, GEORGE THOMAS, of Smethwick, Stafford, manufacturer. *An improvement in furnaces.* Patent dated October 7, 1854. (No. 2155.)

Claim.—The causing of air to pass through or under hollow or ⋂-shaped bars and to enter the front part of the furnace through hollow bearers carried up into the furnace.

ROBERTS, THOMAS, and JOHN DALE, of Manchester, Lancaster, manufacturing chemists. *Improvements in obtaining and treating extracts from certain dye-woods, and in apparatus for obtaining such extracts.* Patent dated October 7, 1854. (No. 2157.)

This invention consists of methods of obtaining extracts from logwood, peach, Brazil, and other woods requiring similar treatment, in which a series of vessels, like the detached ones ordinarily employed, are placed side by side, and made steam-tight at the top, &c.

JOHNSON, WILLIAM, of Lincoln's-inn-fields, Middlesex, civil engineer. *Improvements in windlasses.* (A communication.) Patent dated, October 7, 1854. (No. 2158.)

This invention consists in surrounding the hoisting barrel of the windlass with a screw formed with deep threads or leaves. This screw is detached from the barrel of the windlass, but is fixed to the "bitts" and to the deck, and causes the cable to be received on and given off the windlass uniformly, without the usual "fleeting" or "surging" of the chain, and without its being liable to get foul.

MAYNARD, ROBERT, of Whittlesford, Cambridge, agricultural machinist. *Improvements in machinery for threshing and dressing grain.* Patent dated October 7, 1854. (No. 2159.)

This invention consists—1. In the employment of two spiked feed-rollers revolving

at unequal velocities. 2. In the employment of two jointed slotted plates which are fitted over the feed-rollers. 3. Of a method of resifting the riddlings, and of delivering them by self-acting apparatus to a second process of cleaning. 4. In the employment of springs in threshing machines for suspending the riddles, and for counteracting the shock arising from the vibration of them. 5. Of a new form of drum or beater composed of a series of bars, having a row of studs immediately in advance of their edges, by which the grain is loosened in the ears before it is entirely expelled by the plain surface of the angle iron.

SHANKS, JAMES, of St. Helens, Lancaster, manufacturing chemist. *An improved mode of manufacturing sulphuric acid.* (A communication.) Patent dated October 9, 1854. (No. 2161.)

Claims—1. The decomposition of sulphate of lime, whether native or artificial, by means of chloride of lead, for the purpose of obtaining sulphate of lead. 2. The decomposition of sulphate of lead so obtained by the use of hydrochloric acid, for the purpose of obtaining free sulphuric acid.

CROSSKILL, WILLIAM, of Beverley, York, civil engineer. *Improvements in the construction of portable railways.* Patent dated October 10, 1854. (No. 2162.)

This invention consists in so combining the sleepers, chairs, and rails of a railway that the whole, when united, may be folded into portable forms; in making the longitudinal sleepers and rails of two or more different lengths, capable of being arranged so that when the long and short lengths are laid down alternately on each side the railway shall form a straight line, but that when some or all of the long sleepers and rails are laid down on one, and some or all of the short ones on the opposite side the railway shall form a curve; &c.

WHITE, HENRY THOMAS, of Queen's-terrace, Hammersmith, army accoutrement-maker, and GEORGE ROBERTS, of Great Peter-street, Westminster, miner. *An improved mode of rendering hats, caps, and other coverings for the head self-ventilating.* Patent dated October 10, 1854. (No. 2164.)

The inventors form an elastic cushion, composed of fine wire twisted into the shape of a flat helical spring or otherwise, and attach this to the hat and cover in such manner that the edges will permit of the free passage of air through the elastic cushion when the hat is worn.

HAMMERICH, VALENTINE WILLIAM, of Altona, Holstein, but now at John-street, Minories, London, upholsterer. *An improved construction of buoyant mattress.* Patent dated October 10, 1854. (No. 2165.)

The inventor forms a mattress of a woven material pervious to water, and stuffs it with horsehair or other elastic stuffing, leaving at one edge a separate compartment for the reception of cork or other buoyant material. The mattress is provided with straps or belts for securing it to the body of a shipwrecked person when it is required to be used as a life-buoy.

HANCOCK, SAMUEL, of Woolaton-street, Nottingham, silk-agent. *Improvements in the manufacture of looped fabrics.* Patent dated October 10, 1854. (No. 2166.)

This invention consists in the employment of improved instruments for forming the loops between the needles and carrying the loops forward under the beards of the needles, which instruments perform part of the operations now usually effected by the jack or lead-sinkers; in the employment of improved instruments, and in the method of working the same, for the purpose of bringing the work forward on the needles, pressing down the beards of the needles, regulating the loops, knocking over the work, and drawing it back again, these instruments performing the operations now usually effected by the lead and jack-sinkers and presser-bar of the common stocking frame; &c.

JACKSON, JOSEPH BURDEKIN, of Etna Works, Sheffield, York, and WILLIAM BOWLER, also of Sheffield, engineers. *Improvements in furnaces or fire-places, and in the prevention of smoke.* Patent dated October 10, 1854. (No. 2167.)

Claim.—"The system or mode of supplying air to furnaces and fire-places, for the prevention or better consumption of smoke, by means of a passage or passages along the bottom of the ashpit, opening into the main flue immediately behind the fire space, and furnished with an automatic or partially automatic valve or valves for regulating the supply of air."

KNOCKER, GEORGE WIGSELL, of Bushy Ruff, Dover, Kent, gentleman. *Improvements in obtaining motive power by means of water.* Patent dated October 10, 1854. (No. 2168.)

The inventor describes an arrangement in which the tanks and cylinders employed are placed in two tiers at different heights, and a peculiar system of slide valves, with the application of them to his arrangement.

KERSHAW, JOHN, of Brixton, Surrey, engineer. *Improvements in the manufacture of wrought iron railway wheels.* Patent dated October 10, 1854. (No. 2169.)

The inventor manufactures a solid wrought-iron wheel, by first forming the nave, disc or spokes, and tyre separately, and then welding them together by one or more described processes.

CROSSLEY, HENRY, of Camberwell-grove,

Surrey, civil engineer. *Improvements in the manufacture of waddings for cannons and fire-arms.* Patent dated October 10, 1854. (No. 2170.)

This invention consists in making waddings from spent tan and spent hops, or either of them, mixed with vegetable or animal fibre; these matters being reduced to a dough or thick pulp, placed in moulds, and pressed by hydraulic or other suitable pressure.

CHUBB, WILLIAM, of Clifton, Gloucester, gentleman. *Improvements in the construction of beams and parts of ships, ships' masts and spars, and other like structures.* Patent dated October 10, 1854. (No. 2171.)

This invention consists in forming beams or bars of several pieces of angle-iron combined with or imbedded in wood as described.

CRUISE, ROBERT, of Manchester, Lancaster, engineer. *Improvements in machinery or apparatus for stopping railway carriages.* Patent dated October 11, 1854. (No. 2177.)

Claims.—1. The adaptation to carriages of a sliding rod combined with the friction breaks, and connected together by a yielding apparatus. 2. The application to the friction breaks of elastic abutments. 3. The application to the break van of two sliding rods through which power is communicated, such rods being capable of moving in opposite directions.

SHAW, THOMAS, of Preston, Lancaster, machine-maker, and RICHARD DIXON, of the same place, machine-maker. *Improvements in slubbing, roving, and jack-frames employed in the preparation of cotton and other fibrous substances.* Patent dated October 11, 1854. (No. 2179.)

This invention mainly consists in the application and use of detaching stays or levers, working on one common fixed centre at one end, and supporting the top of the flyers at the other, for the purpose of steadying and checking the vibrations of such flyers in slubbing, roving, and jack frames when driven at a high velocity.

SEVILLE, EDWARD JOHN, of Brixton, Surrey, gentleman. *An improvement in the manufacture of hats.* (A communication.) Patent dated October 12, 1854. (No. 2180.)

This invention consists in cementing the parts of the linings of hats to the interior of the hat-bodies, so as to form part of them, in the same manner as the silk or other coverings are affixed to the exterior.

WHITE, WILLIAM, of York Villa, Kensington-park, Bayswater, consulting chemist. *Improvements in the manufacture of manures.* Patent dated October 12, 1854. (No. 2181.)

"I introduce," says the inventor, "into a retort or apparatus in which is charcoal in a state of incandescence, a quantity of potash, or ashes of wood, or vegetable matter yielding potash. I also prepare blood by the action of sulphate of alumina and obtain the same in a dry and pulverulent condition, and I combine the same with the charcoal above-mentioned, and also with matters yielding phosphoric acid and other fertilizing elements; and in some manures in order to prevent disease in plants and vegetables I combine the following matters: hydrate of lime; sulphate of alumina; sulphate of protoxide of iron; sulphate of protoxide of magnesium; charcoal and chloride of sodium; and I obtain and apply products by the destructive distillation of night soil and animal matters by condensing the products which come over, and I combine these matters in preparing manures as above-mentioned."

CHANCE, JAMES TIMMINS, of Birmingham, Warwick. *Improvements in manufacturing articles from the minerals or rocks of the descriptions commonly called basalt or trap, sometimes rowleyrag or whinstone.* Patent dated October 12, 1854. (No. 2182.)

This invention consists in subjecting fused masses of the minerals or rocks mentioned in the title to pressure, by means of rollers and pressing apparatus, in order to produce various articles such as slabs, sheets, bars, &c.

ROUTLEDGE, ANCEL ALEXANDER, of Neath, Glamorgan. *Improvements in the manufacture of detonating railway signals.* Patent dated October 12, 1854. (No. 2183.)

These improvements consist—1. In so forming and connecting the parts of such signals that the edges may be soldered and rendered impervious to moisture. 2. In forming such signals with a projecting end or plate, which, being bent down, will pass between the ends of two rails of a railway, and thus prevent the signal from being brushed off the rail. 3. In forming such signals of a tapering form so that the wheel of the engine or tender may the more certainly pass over them without knocking them aside.

DELSARTE, FRANÇOIS ALEXANDRE NICOLAS, professor, of Rue Croix Boissière, Paris, France. *A new mode of and apparatus for tuning pianos and other kinds of stringed instruments.* Patent dated October 12, 1854. (No. 2186.)

This invention consists in tuning such instruments, or in ascertaining whether they are exactly tuned, by applying to them any suitable stopping apparatus by which the vibrating parts of all or some of the strings may be temporarily brought at pleasure to a certain standard length or lengths and

then tuned in unison, and finally restoring the strings to their primitive vibrating lengths by removing the apparatus from them.

ANDERSON, SIR JAMES CALEB, of Fermoy, Cork, Ireland, baronet. *Improvements in locomotive engines.* Patent dated October 13, 1854. (No. 2189.)

The inventor claims—1. Certain new arrangements of boilers. 2. A safety-valve to be placed on the fire-box. 3. Pumping the water into the fire-box, and thence into a tube cylinder. 4. Certain modes of steering locomotives. 5. A certain described condenser; also, the forcing of cold air, by a fan or otherwise, into a vessel or vessels to condense the exit steam by contact with it. 6. A separate engine to work the fan, to blow the fire, or to force the air into the condenser. 7. A turn-stile, to check the number of passengers conveyed by locomotive carriages.

DOBSON, ARTHUR, of Belfast, Antrim, Ireland, bleacher. *Certain improvements in looms for weaving.* Patent dated October 13, 1854. (No. 2190.)

This invention consists of improved combinations of machinery for imparting a positive motion to the vibrating rail of a loom, which motion can be regulated according to the shed; also in the application of certain parts by which the warp is held when it is separated to form the shed. By means of these improvements the injurious strains on the warp are to be diminished or avoided, and a more uniform cloth produced than heretofore.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

LANDER, JOHN ADAMS, of the Southwark-bridge-road, civil engineer. *Improvements in machines employed in and for the manufacture of spikes and nails.* Application dated October 5, 1854. (No. 2146.)

The inventor forms the cutting edges of hardened and tempered cast steel and the other part of the shears of cast iron or other metal, and securely connects the steel cutting edge to the other part by screws, by which arrangement he is enabled to adjust the cutting edge independently of the other part of the shears, or to remove it for repairing or sharpening, or to substitute an entirely new one for it.

BRITTEN, JOHN, of Birmingham, Warwick, engineer. *A new or improved machine for sweeping or cleaning chimnies.* Application dated October 6, 1854. (No. 2150.)

The inventor describes a machine composed of elastic brushes, mounted on elastic stems, and furnished with a guide roller, and a brush for cleaning the top of the chimney.

KERR, PETER, of Paisley, Renfrew, thread manufacturer. *Improvements in the treatment and finishing of threads or yarns.* Application dated October 6, 1854. (No. 2151.)

The yarns or threads to be finished are taken direct from bobbins, or from a beam upon which they have been previously wound, and are first passed through a reed fixed at one end of a framing carrying the finishing details. On leaving the first reed the threads pass between a pair of rollers, the lower one of which revolves in a trough supplied with the starching or other matter with which the threads are treated, and afterwards pass through a second reed, and then between a series of polishing rollers.

BLUNT, CHARLES, of Sydenham, Kent, gentleman, and JOSEPH JOHN WILLIAM WATSON, of Wandsworth, Surrey, doctor of philosophy. *Improvements in machinery for the production of artificial fuel.* Application dated October 7, 1854. (No. 2153.)

This invention consists in the construction and arrangements of a centrifugal apparatus by which the inventors pulverize and commingle the materials composing their artificial fuel, and of channels or conduits distributed in radiating lines in and around the sub-basin of the centrifugal machine, by which means they condense the said materials towards the moulds, affording to the mass the requisite consistency.

DE MERITENS, JEAN BAPTISTE SERAPHIN, gentleman, of Paris, French Empire. *Certain improvements in the mode of dyeing cotton, flax, and other fibrous substances and fabrics generally.* Application dated October 7, 1854. (No. 2156.)

These improvements have for object the fixing of all colours upon thread, cotton, wool, silk, and fibrous substances and textile fabrics generally, and do not relate to changes in the ingredients, but to the following methods of preparing and employing them. 1. Instead of using as many baths as there are different dyeing substances, the inventor makes use of but one single bath containing the whole of them. 2. He uses water from springs or wells only. 3. The bath contains water and the dyeing ingredients, and is reduced one-third by evaporation over a fire. 4. The threads or goods are immersed in the bath in a cold state. 5. After each immersion the threads or goods are dried in the open air and in the shade. 6. These immersions and dryings are to be repeated alternately at least three or four times, then the threads or goods are to be washed in water, or in soap and water, to get rid of any excess of dye; and finally, they are to be dried in the sun.

AIKMAN, JAMES, of the firm of James

and George Aikman, of Paisley, Renfrew, finishers. *A roller for scouring and finishing textile fabrics.* Application dated October 9, 1854. (No. 2160.)

This invention consists in adapting and applying to the purpose of scouring and finishing textile fabrics a roller composed of stone in substitution for those which have hitherto been used for the purpose.

PROTHERY, NOEL, of Lyons, France. *Improvements in machinery for making lace.* Application dated October 10, 1854. (No. 2163.)

The improved machine consists of a lace frame in which all kinds of lace are produced by means of thread-carrying spindles and holding needles for holding the points, both being moved by a Jacquard apparatus.

MELLIER, MARIE AMÉDÉE CHARLES, of Paris. *Improvements in the manufacture of paper.* Application dated October 10, 1854. (No. 2172.)

The inventor takes straw or other vegetable fibrous material, cuts it into short lengths, washes it well, and soaks it in warm water; he then places it in a suitable close vessel, where it is retained between two plates of perforated metal, and boiled under steam pressure of at least 56 lbs. per square inch by means of steam; &c.

TAYLER, WILLIAM HENRY, chemist, South-row, New-road, St. Pancras, Middlesex. *Improvements in cartouche-belts or cases for containing cartridges to be worn round the waist, or otherwise, calculated for arms of every description, guns, pistols, and other fire-arms.* Application dated October 11, 1854. (No 2175.)

The inventor describes an improved belt formed of two cases, of which the outer is made impervious to damp, and is provided with an opening for the removal of the cartridges, and a flap to cover it. The inner case receives the cartridges and is capable of being turned round by the finger, which is inserted in the hole from which the last cartridge has been removed.

ROGERSON, SAMUEL, and JAMES ROGERSON, of Manchester, Lancaster, trimming-manufacturers. *Improvements in the production of ornamental patterns upon velvet and other woven fabrics, and in machinery or apparatus for effecting the same.* Application dated October 11, 1854. (No. 2176.)

This invention refers to the obtaining of patterns in relief upon velvet and other fabrics, the raised parts of such patterns being of one colour and the ground of another. In order to accomplish this, the inventors apply a stratum of flock, pulverized silk, or other finely-divided substance, in conjunction with farina or other adhesive substance, and then by means of suitable machinery emboss the desired pattern. This causes the flock to adhere to the surface which receives the pressure, after which the fine material is brushed away, and the woven fabrics are exposed at the elevated parts.

JACKSON, JOHN, of Belfast. *Improvements in treating or preparing tow, so as to render it fit for drawing or roving.* Application dated October 11, 1854. (No. 2178.)

In carrying out this invention a rotatory brush is employed which, acting amongst the hackles, removes the tow from them and delivers it to a doffing cylinder (clothed with card teeth), from which it is removed by a blade, and is caused to pass between a pair or pairs of rollers from which it is received in a can or receiver.

HOOD, JOSEPH, of Newmilns, Ayr, machinist. *Improvements in ornamental weaving.* Application dated October 12, 1853. (No. 2184.)

The essential feature of this invention consists in causing the pikes of the needle frames to work amongst a series of wires, and in spaces formed by the action of a Jacquard machine, in lifting or shifting certain of the wires.

PARKER, ALEXANDER, of Newmilns, Ayr, pattern-cutter. *Improvements in ornamental weaving.* Application dated October 12, 1854. (No. 2185.)

This invention consists in the employment of a perforated pattern in combination with a row or rows of needles.

HANCOCK, JAMES LAMB, of Milford Haven, Pembrokeshire. *An improved machine for ploughing or working land.* Application dated October 13, 1854. (No. 2188.)

This invention consists in fixing to a metal plate which is placed edgewise knives fixed so as to cut the land, as it were, into slices laterally on both sides of the plate, and to act one after and below the other.

*** Nos. 2187 and 2194 have not been allowed. The documents of No. 2192 are with the law officers under objection.

PROVISIONAL PROTECTIONS.

Dated March 29, 1855.

704. William James, of Crosby Hall-chambers, London, iron merchant. Improvements in the manufacture of screw-bolts.

Dated March 30, 1855.

710. George H. Babcock and Asher M. Babcock, of Westerly, Rhode Island, United States of America. Improvements in presses for printing in colours, called polychromatic printing presses.

Dated April 4, 1855.

754. Robert Hills, of Caroline-place, City-road, Thomas Miles, of Queen-street, Finsbury, and Henry Monument, of Caroline-place, City-road. Improvements in bottles, jars, and other similar

vessels to facilitate the corking or stopping of them.

Dated April 5, 1855.

756. Thomas Squire, of Latchford, Chester, tanner. Improvements in removing hairs from hides and skins. A communication.

758. Isidore Carlhian, of Rue du Sentier, Paris, France, and François Isidore Corbière, of Castle-street, Holborn, London. Improvements in apparatus for making soda water and other aërated liquids. A communication from Messrs. Gaillard and Dubois.

760. Joseph Brazier, of Wolverhampton, Stafford, manufacturer. An improvement or improvements in revolving or repeating fire-arms.

762. Denny Lane, of Sundays Well, Cork, merchant. Improvements in obtaining power by water.

764. Abram Longbottom, of Soho Foundry, Meadow-lane, Leeds, York, engineer. Improvements in preparing sand and materials to be used when casting. A communication.

766. Peter Arrive, engineer, of Spencer-street, Darnley-road, Gravesend, Kent. Improvements in safety-valves of steam-boilers.

Dated April 7, 1855.

768. Robert William Waithman, esquire, of Bentham House, York. Improvements in machinery or apparatus for the manufacture of lint or similar substances.

770. Alexander Rollason, of Birmingham, Warwick, photographic artist. Certain improvements in photography.

772. Richard Stones, of Kingston-upon-Hull, York, brass-founder. Improvements in taps or cocks for drawing off fluids.

774. Joseph Aresti, of Greek-street, Soho-square, Middlesex, lithographer. A method of obtaining improved effects upon drawings washed or painted on stone.

776. David Griffiths Jones, of Harrington-square, Hampstead-road, Middlesex, M.D. A new or improved farinaceous food.

Dated April 9, 1855.

778. James Clarkson Kay, of Bury, Lancaster, engineer. Improvements in the construction of pressure and vacuum gauges.

780. Edward O'Callaghan, lieutenant of H.M.'s Fifty-first Light Infantry. Improvements in ordnance, and in projectiles applicable to ordnance and small arms.

782. William Bull, of Ramsey, Essex, clerk. An improved instrument for cutting or slicing turnips and other vegetables.

Dated April 10, 1855.

784. William Ricketts and Thomas Bulley, of Stepney, Middlesex, painters and grainers. Improvements in producing ornamental designs on painted or japanned table-covers.

786. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in the construction of steam boilers. A communication from M. S. Boutigny, of Paris, France.

788. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for combing wool and other fibrous substances. A communication from Victor Brosser, of Beauvais, France.

790. Louisa Monzani, widow and administratrix of Willoughby Theobald Monzani, late of St. James's-terrace, Blue Anchor-road, Bermondsey, gentleman, deceased. Improvements in folding-stools and folding-chairs. A communication from her late husband.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

800. Eugène Pasquier, engineer, of Rheims, France. An improved machine to be used for drying wool and other fibrous materials. April 11, 1855.

806. Soren Hjorth, of Copenhagen. An improved electro-magnetic battery. April 11, 1855.

807. Soren Hjorth, of Copenhagen. An improved electro-magnetic machine. April 11, 1855.

808. Soren Hjorth, of Copenhagen. An improved electro-magnetic machine. April 11, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," April 24th, 1855.*)

2588. James Higgins and Thomas Schofield Whitworth. Improvements in the manufacture of bayonets, and in machinery or apparatus connected therewith.

2597. William Davis. Improvements in furnaces.

2635. William Charles Scott. Improvements in paddle-wheels.

2640. William Clark. Improvements in anchors.

2644. Francis Archer and William Papineau. Improvements in distilling peaty, schistose, bituminous, and vegetable matters.

2648. Peter Joel Livsey and William Weild. Improvements in cartridges and projectiles, and in the construction, mounting, and working of ordnance.

2657. Juliana Martin. A safety apparatus for effectually cleaning windows from the inside of a room.

2664. Edwin Whele. Improvements in oil and other lamps.

2669. James Pritchard. Certain improvements in the construction of screw-propellers.

2673. John Avery. Improvements in machinery for cutting metallic bars. A communication from Samuel Hall, of New York, United States of America.

2674. Frederick Robert Augustus Glover. Improvements in or applicable to the construction of carriages.

2677. Joseph Tucker. An improvement in the construction of ships for saving persons in case of shipwreck.

2681. John Paul. Improvements in machinery or apparatus for colouring or staining the surfaces of paper, leather, woven fabrics, and similar materials.

2691. George Bell and George Charles Grimes. Improvements in the manufacture of lucifer or congreve matches and other instantaneous lights.

2705. Frederic Prince. Certain improvements in the nipples of fire-arms.

2714. John Francis Porter. Improvements in the manufacture of bricks and tiles.

2715. George Anderson. Improvements in purifying sewers and buildings, or other places, of noxious vapours.

2725. James Dundas. Improvements in the manufacture of cannon and ordnance of every description.

13. Félix Gabriel Célestin Dehaynin. Improvements in the purification of hydrogen gas.

18. John Henry Johnson. An improved system or mode of coating iron with copper. A communication.

54. André Gaspard Guesdron. A furniture table which may be used for different purposes.

64. Edward Booth. Certain improvements in the mode and machinery for dressing, starching,

and finishing textile and other fabrics and materials.

149. Thomas Cöendoz Hill. An improvement in drain-pipes and tiles.

206. John Henry Johnson. Improvements in the construction of kites, and in the application thereof to the purposes of carrying lines, and of signalling. A communication from André Marie Préverand, of Paris, France.

215. William Polkinhorn. Improvements in apparatus for cleansing wheat.

336. John Raphael Isaac. Improvements in the construction of portable buildings.

382. George Heppel. An improved rotary pump and engine. A communication from John Mortimer Heppel, of Coire, Switzerland.

391. Thomas Harrison. A composition for covering and protecting the bottoms of ships and vessels.

464. William Hodges. Certain improvements in boots and shoes.

468. John Coney. An improved construction of gun-lock.

637. William MacNaught. Certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.

678. John Getty. An improvement in the construction of steam and other vessels.

712. Joseph Morgan. An improvement in the manufacture of candles in which tallow is used.

718. Charles Whitley. Improvements in machinery or apparatus for drilling.

722. William Edward Newton. An improved mode of constructing centre-bits. A communication.

724. George Fergusson Wilson and George Payne. An improvement in treating oils to obtain an elastic product.

734. Richard Peyton. Improvements in the manufacture of iron gates and fences.

752. Christopher Nickels and James Hobson. Improvements in weaving pile fabrics when wires are used.

762. Denny Lane. Improvements in obtaining power by water.

790. Louisa Monzani. Improvements in folding-stools and folding-chairs. A communication from her late husband.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed April 20, 1855.

2251. William Green and Joseph Pickett.
2252. Edward Abell.
2254. George Savage.
2255. Abraham Gerard Brade.
2266. Joseph Hopkinson the younger.
2278. Louis Vital Helin.
2280. William Grindley Craig.
2282. John Healey, John Foster, and John Lowe.
2346. William Childs the younger.
2364. James Whitehead.
2394. Eugene Rimmel.
2414. George Bodley.
2536. Dominique Bazaine.

1855.

116. JeanAntoine FrançoisVictor Oudin.
318. Alexander Sands.
340. William Blythe and Emile Kopp.
356. Andrew Henshaw Ward, junior.
388. George Noble.
410. John Henry Johnson.

Sealed April 24, 1855.

2142. Thomas Harris.
2273. William Thomas Smith and George Hill.
2285. Joseph Eccles.
2287. James Griffiths.
2289. Auguste Edouard Loradoux Bellford.
2291. Astley Paston Price.
2292. William Ashton.
2297. Edward Lindner.
2298. Jean Pierre Savouré.
2319. George Taylor.
2320. James and William Bradshaw.
2334. Edouard Alexandre.
2353. Andrew Peddie How.
2360. John Blaikie.
2381. David Tunks.
2385. James Niven.
2396. William Kloen.
2400. The Hon. William Edward Fitzmaurice.
2426. Robert Wilson.
2479. Henri Jules Duvivier and Henri Chaudet.
2541. Peter Armand Lecomte de Fontainemoreau.
2544. Henry Strong.
2737. Peter Haworth.
2747. Ashton Stansfield and Josiah Greenwood.

1855.

22. John Venables and Arthur Mann.
23. John Venables and Arthur Mann.
61. Thomas Wilson.
199. George Bell.
233. John Smith and James Hollingworth.
243. William Taylor.
247. Alexander William Williamson.
319. Louis Adolphe Ferdinand Besnard.
337. James Nichol.
339. Francis Brown Blanchard.
347. William Spence.
353. Fortunato Gaetano Pietro Maria Vittorio Maneglia.
380. Thomas Organ and George Pitt.
389. Paul Prince.
397. Frederick William East and John Mills.
413. John Scott Russell.
421. Charles Henry Roberts.
458. James Lewis.
467. Alfred Vincent Newton.
479. Timothy Walker Carter.
501. Eugène Tardif.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietor's Names.	Addresses.	Subject of Design.
April 4	3701	B. Wheeler	Nottingham	Fire-brick.
5	3702	F. De La Rue and Co.	Bunhill-row	Fastenings for portfolios.
,,	3703	Foster, Porter, and Co.	Wood-street	Alliance shawl.
7	3704	N. Greig, R. Taylor, and J. Chandler	Bermondsey	Can-jar or case.
10	3705	N. Brough	Birmingham	Clasp or buckle.
11	3706	T. F. Hale	Bristol	Sling-action beer-engine.
18	3707	A. Emett.	Liverpool	Chimney Top.
,,	3708	Knight, Merry, and Exley	Birmingham	Cooking-lamp.
20	3709	E. B. B. Wren	Tottenham-court-road	Camp arm-chair.

PROVISIONAL REGISTRATIONS.

Date	No.	Proprietor's Names.	Addresses.	Subject of Design.
Mar. 30	649	W. A. Morrison	Middlesex	Breech-loading ordnance.
31	650	J. Hinks	Brompton	Protector for rolled ribbons.
Apr. 11	651	C. Wills	Winchester	Union railway-chair.
,,	652	T. Bullock	Chelsea	Lever tap.
12	653	J. F. Fenner and T. H. Hidey	Gray's-inn-road	Tobacco-pipe.
,,	654	G. Grout	Tottenham	Crochet cotton armlet.
17	655	J. Cooke	Colchester	Portable Poultry pen.
18	656	J. S. De Pinna	Regent's-park	Artificial grape.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne Paris; Macnn and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

1656.] SATURDAY, MAY 5, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

CARR'S PATENT STEERING APPARATUS.

Fig. 1.

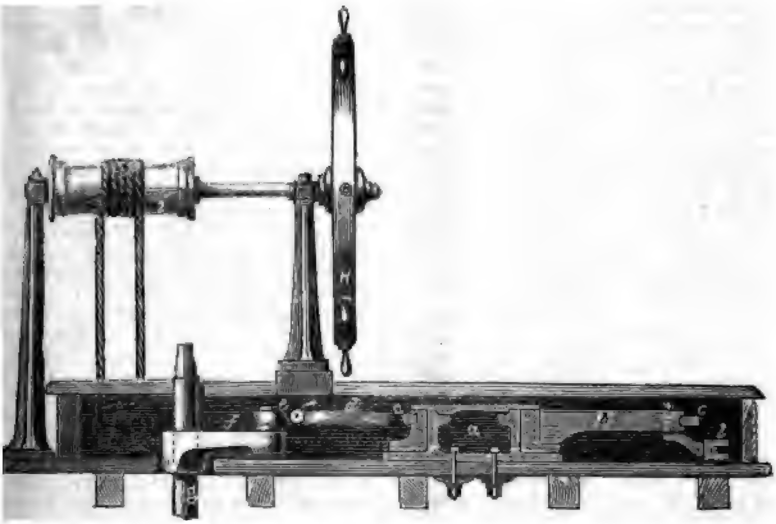
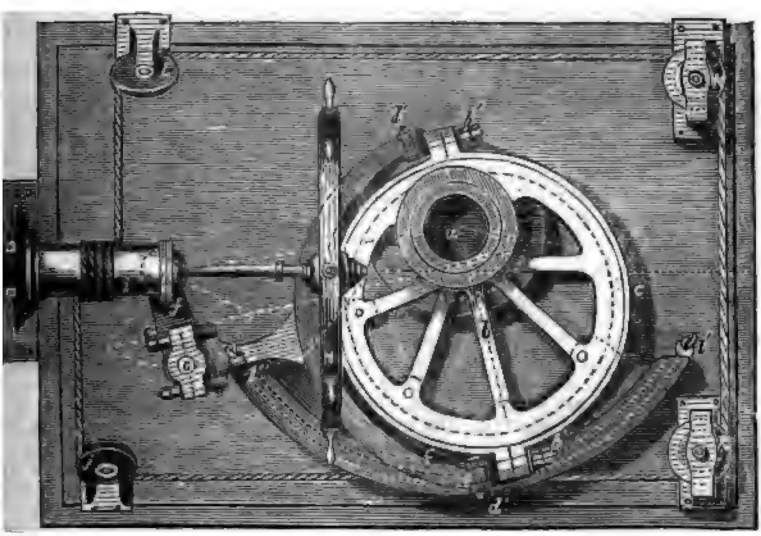


Fig. 2.



CARR'S PATENT STEERING APPARATUS.

(Patent dated August 28, 1851.)

Mr. T. Carr, of Liverpool, sharebroker, has patented an arrangement of mechanism for transmitting the necessary motion from the steering-wheel to the rudder, by means of which forces acting upon the rudder, arising from the striking of the water against it, will be slightly yielded to, and prevented from acting prejudicially upon the steering ropes or the helmsman, as is often the case in consequence of the too great rigidity of the common steering apparatus.

The invention consists, according to the inventor, in the application and arrangement of an eccentric, cam, or either of their equivalents (but by preference the eccentric), as a means through which the requisite motions may be conveyed to rudders. The following is his own explanation of the manner in which it is carried into effect:—"I mount," says he, "an eccentric with its axis on a vertical stud or shaft, and fit it with a strap and short rod, jointing the end of the latter with the end of the tiller. From the shaft of the steering-wheel I impart a revolving or oscillating movement to the eccentric, by means of toothed wheel-work, or by the arrangement commonly applied (a barrel and chain or rope) for giving motion to the tiller, which I cause to impart motion to an arm or quadrant (corresponding to the tiller), which is keyed or otherwise secured on the shaft of the eccentric, so as to impart its motion to the eccentric. It will now be seen with this arrangement, that on the eccentric receiving a revolving or oscillatory movement, its action will be conveyed by the connecting rod to the tiller, and will thus be imparted to the rudder; but from the nature of the eccentric it will be obvious that the rudder will have little power to act through the connecting rod upon the eccentric to revolve it, and the steering-wheel connected with it, by reason of the friction against revolution in the eccentric counteracting the force which the connecting rod will exert tending to revolve the eccentric; the resistance of the eccentric to revolution being increased or diminished by increasing or diminishing the diameter of the eccentric, the throw or amount of eccentricity remaining the same."

Fig. 1 of the engravings on the preceding page shows a sectional elevation, and fig. 2 a sectional plan of the arrangement of mechanism, which the inventor prefers to use in carrying his invention into effect. In fig. 1 the eccentric is shown in one of its extreme positions; in fig. 2 it is shown in its middle position, that is, in the position it occupies when the rudder is in a line with the keel of the vessel. *a* is a short stud fixed to the deck of the vessel; *b* is the eccentric, the axis of which is free, and fits on the stud, *a*, being secured upon it by a plate or cap bolted to the stud; *c* is a strap, fitting into a groove formed in the rim of the eccentric, and made in two halves, so that it can be bolted on the eccentric by the bolts, *b′*, the heads of which are formed to joint with the forked ends of the connecting rod, *d*, which are secured to the heads of the bolts, *b′*, by pins, *d′*; and the other end of the forked connecting rod is jointed with the heads of the bolts, *e″*, (by means of a pin), which screw together the swivel parts, *e′*, that embrace the pin or stud, *e*, fixed in the end of the tiller or lever, *f*, which is secured to the fulcrum of the rudder, *g*. With this arrangement the connecting rod, *d*, will not be strained, but will be free to vertical oscillations, which may be given to it by vertical motion in the rudder, *g*. Motion is imparted to the eccentric by the steering-wheel, H, (which may be made with a weighted rim, so as to act like a fly-wheel on receiving an impulse), which is mounted on a shaft in bearings in the usual manner; *i* being the barrel or drum, around which the rope or chain is wound and made fast, one end passing in this case round the obliquely placed sheave pulley, *j*, and being secured to the end, *l′*, of the quadrant, *l*, (which is bolted to the eccentric); the other end passes through the sheave pullies, *j* and *k*, and is secured to opposite ends of the quadrant, *l″*. In the arrangement shown, the eccentric is only turned about one-third of a revolution, its eccentricity being made sufficient to give the extreme movements required by the rudder with that amount of revolution; but if made to revolve completely, the amount of eccentricity may be diminished; in which case, instead of the quadrant or segment of a pulley, *l*, an entire pulley may be used, and the sheave pulleys, *k k*, dispensed with. Both ends of the rope or chain, after passing through the sheave pulleys, *j j*, may be directly secured to the pulley, *l*. From what has been described, it will now be understood that the revolving of the steering-wheel, H, will cause the eccentric, *b*, to turn on the axis, *a*, and that its reciprocating movement will give the requisite movements to the rudder, *g*; and it will be seen that while the rudder can easily be acted upon by manual power applied to the steering-wheel, the proportions of the eccentric may be so adjusted that it will itself, on the contrary, have but small power to act through the eccentric upon the steering-wheel, which will, therefore, for the most part, remain in whatever position it is placed in, without exertion on the part of the helmsman to hold it in such position; but as it is found inexpedient to make the mechanism perfectly rigid, the rudder is allowed to

have a little action on the eccentric (and therefore on the steering-wheel) when subjected to heavy impulses from the water, the amount of which may be regulated by proportioning the parts as before explained, that is, by increasing or diminishing either the diameter of the eccentric, its eccentricity remaining the same, or the stud or axis on which it revolves, or both, according as a greater or less degree of rigidness is required. It will be evident, that in place of the eccentric, a modification of it, approaching a crank, or a lever, may be employed, as the action of the two is precisely the same, the eccentric being only a crank with a pin enlarged sufficiently to embrace its axis of rotation; but as an ordinary crank is in a large degree free to impulses acting at right angles to it, the parts will require arranging and modifying to increase the friction, so as to destroy, to a great extent, the reactive force of the rudder upon it, which may be accomplished, as before stated, by considerably increasing the diameter of the fulcrum or axis of the crank, or lever, or the diameter of the part corresponding to the crank pin, or both.

ON THE SEWAGE OF TOWNS AND CITIES.

Nature provides sewers in brooks, streams, and rivers, and cesspools in those large swamps and deltas which gather "cess" and exuviæ from the hills and mountains—those upas localities which give sufficient warning to the mere animal instinct of man at first, and to his intellect as time advances that, though they are well adapted to foster the vegetation on which he so largely depends, they are not places in which he can himself grow to the perfection of his nature. The sloping sides of hills, and elevated porous plains, and not the saturated valley, nor the marsh, nor the delta, are the sites marked out by Nature for man to rear his dwelling upon; and if, despite of Nature's warning, he will, from idleness or cupidity, dwell in swamps, his stature will inevitably be dwarfed, his body diseased, and his life shortened.

In and about this city of London, spread out on both sides of the river, we have hills, and valleys, and swamps; and it is clear that these swamps, whether of Battersea, Deptford, Greenwich, the Isle of Dogs, or the Essex Marshes, are appointed to be garden ground for the growth of vegetables for the citizens, and as clear that the hills are intended for the residence of the citizens themselves, possessing more or less of salubrity according to the natural conditions and artificial capabilities of the soil. In circumstances of inadequate knowledge, men have unfortunately converted garden grounds into dwelling-places, and unhealthy proximity to the centre of London has been deemed of more importance than healthy distance from it. Houses are built in swamps below the level of the river, and the consequence is, a heavy per centage is deducted from the number and value of the population, regarding them merely as wealth-producing creatures, while their moral worth, it is well known, decreases in proportion as life becomes hazardous and short.

If we stand on a hill-side, and look down over a swampy valley, in the early morning or the evening, we behold it covered with a mist rising several feet above the surface of the ground. This mist is the recipient of malaria—a kind of wet sponge holding gaseous poison. Over all the moist surface of the earth this mist prevails more or less, but is densest and deepest in low levels. At a certain height, beyond the reach of this ground fog, the whole atmosphere is equally healthy. Where, therefore, a house is built in a marsh sufficiently high to pierce through this fog, human beings may live healthily over the marsh, in pure air; and the upper rooms of a lofty house in a marsh, might actually be healthier than ground-floor rooms on a hill. But it is evident that the residences in the marsh must be much more costly than those on the hill. So also it may be possible to drain a marsh artificially, but it will be at a considerably greater cost than to drain a hill; and this cost is so much greater, that we think it quite probable the time will come when the necessity of a change will force itself on the population of London, and the low rent of Deptford Marshes will be considered no compensation for loss of time, and money, and diminished production, and ruin of health. It is quite a possible thing that the extension of London will be along the hills and ridges, and that Deptford and Bermondsey, and similar places, will revert to their natural purposes. A roadway from Greenwich Hill along the high lands of Kent would afford better dwellings at a cheaper rate, and quite as accessible to London, as the miserable dens whose very look-out seems to engender fever and ague, and drives the inhabitants to unhealthy stimulants.

Thus far we have merely considered material circumstances, but by the aggregation of men in numbers, large quantities of exuviæ are produced, the vapours from which are many degrees more pernicious than those produced by mere rotting vege-

tation. In thinly-peopled districts this may be left to disperse in the atmosphere; but even then, in a summer season, the exuviæ from a single house has been known to decimate a neighbourhood. In short, if men lived wholly like animals, the evil would be less than that occasioned by the ordinary arrangements of a dwelling without drains or sewers. From cesspool collections there is no hope of desiccation. Water percolates and fills the soil in all directions, and, like a churchyard, the site of a town becomes gradually poisonous, with more or less of virulence.

Even with drains and sewers, bad construction often makes of them what has not unaptly been termed "elongated cesspools;" but even if well drained, say in the metropolis, the ultimate receptacle being a tidal river, we only spread about, but do not remove the evil. Moreover, the very principle of sewers involves a difficulty at the outset. As the town increases, the relative capacity of the sewers decreases, and constant alterations are required in default of a wasteful outlay at the commencement.

We are, therefore, of opinion that the exuviæ of dwellings in towns should not be discharged into the sewers and then into the river, but should be dealt with chemically in each individual house, so as thoroughly to deodorise it; and if possible such exuviæ, thoroughly deodorised, should be the servant's perquisite, and as much care would be bestowed upon it as in the case of kitchen-stuff. If it can be treated chemically, so as to make its removal as little obnoxious as the removal of dust, the great difficulty of sewage will be at an end.

Thus far we agree with the author of a pamphlet before us, on the "Effectual Drainage of Towns,"* that the sewage may be better dealt with in small quantities than in large,—that it cannot be dealt with in large quantities by means of drains and sewers to any other effect than merely moving the pollutions to another spot, without destroying the evil. Even in seaport towns, where it is sought to convey the sewage into deep water, it is rarely effectual; and the visitors who throng those places in summer will, sooner or later, abandon them, unless some effectual measures are taken to remove and neutralise the abomination.

The pamphlet before us begins thus:

"The three objects proposed to be effected by this scheme, as indicated in the preface, are, the

"Drainage of Towns;

"Employment of Convicts; and

"Provision of Lodgings for the Working Population."

It then proceeds:

"The main sewer being divided into sections or parts, each serving the entire drainage of a district, an opportunity is afforded of acting upon the collected mass of sewage of each district independently of the adjoining districts. Thus we may suppose a main sewer, as now existing, to extend a distance of two miles, and be divisible into ten districts, to each of which a length of main sewer equal to 1056 feet will properly belong. Let us adopt one of these sections of main sewer, 1056 feet in length, and proceed to apply the proposed apparatus to it. In the lowest part of the district, and as nearly contiguous to the main sewer as possible, a space of ground about 200 feet long and 100 feet wide is to be obtained as a site for the receptacles, &c. It generally happens that the lowest sites in large towns are the least valuable, and are thus frequently employed for manufactories or other inferior purposes, or left as waste ground, being unremunerative for building purposes, and objectionable in respect to access and locality. These inferior and cheap spots are the most preferable as the locations of the sewage receptacles. If the site is immediately contiguous to the main sewer, the means of connection will be of the simplest kind, and consist of a branch connected with the main at right angles, or nearly so, and provided with four or five outlets, dipping, with as much fall as can be conveniently obtained, into the receptacles. If, however, the positions of the existing main sewer and the new receptacles are remote from each other, a branch sewer is to be constructed leading the sewage from the former into the latter, the relative levels of all the parts of the apparatus being such that the natural or hydrostatic tendency of the sewage shall be uniformly *away* from the sewer and *towards* the receptacle. Our site of 200 feet in length is to be divided into five portions of nearly equal width, and of uniform length; four, or on occasion, all the five, of these portions are available as receptacles into which the sewage is allowed to flow as rapidly as it may accumulate in the main sewer. Each receptacle is to be filled in succession, or each may be partly filled in succession, according to circumstances, the total capacity of the receptacles being equivalent to, and somewhat in excess beyond, the estimated bulk of sewage that can under ordinary circumstances be committed to them."

* * * *

"Objections are commonly entertained against all methods of sewage treatment, upon the ground that the receptacles or tanks in which the sewage is received and

* "A Scheme for the Effectual Drainage of Towns: with Projects of important National Measures which may be engrafted upon it. London: John Weale, 59, High Holborn, 1855."

treated must of necessity emit effluvia and gases offensive to the senses and dangerous to human health. In the plan here proposed, these objections are completely obviated, the entire surface of the tanks being protected by a stratum of coal ash with (in some cases) an admixture of gypsum, or other calcareous or deodorising material. This stratum is of sufficient thickness to prevent the escape of the gases, and will be treated so as to absorb all volatile matters in the sewage as rapidly as they are engendered. Methods have been proposed for accomplishing this purpose by elaborate chemical mixtures and processes of crystallisation; but these are not now considered necessary, it being found by all experiments in this department that coal ash is an active absorbent of the odorising ingredients of sewage, and effectually arrests all the volatile matters which constitute its most valuable fertilising properties.

"This coal ash is contained in boxes or cases which are supported upon beams or girders over the tanks, the boxes being perforated in such manner that free access is afforded to the coal ash from the sewage in the tanks. The coal ash becoming in course of time saturated with the rich vapours from the sewage, is to be mixed in certain proportions with the solid parts of the sewage, thus increasing its total quantity without deteriorating its fertilising properties. The boxes of coal ash above the tanks will then be renewed, and the process proceed. It is intended, moreover, that these boxes shall be so constructed that the lower and more saturated portions of the coal ash in each box may be renewed from time to time, as often as may be required, by placing fresh coal ash on the upper stratum, and by this means renewing and replacing the saturated coal ash, which would be crushed, rubbed, or shaken into the receptacle by a triturating apparatus connected with the lower part of the boxes. In this manner the upper stratum of coal ash could never become impregnated by any saturation or gaseous effluvia, and it would never be necessary to remove the boxes except for repairs. In this manner the upper and non-impregnated part may remain as a constant protecting stratum, or it may be renewed at long intervals of time, as found best in the practical working of the plan. Sliding perforated bottoms or trays within the boxes, or other suitable apparatus, may be employed for this partial renewal of the coal ash.

"The several stages through which it is proposed that the sewage shall pass after its reception in the tanks are:

"*Settling or Deposition by which the Sewage will be divided into Liquid and Solid Portions.*

"Racking off and filtering liquid portion.

"Discharge of filtered water into deep well.

"Subsequent discharge into deepest well.

"Pumping up into high reservoir; and

"Ultimate dispersal for manufacturing or other purposes.

"Mixing and drying solid portion.

"Grinding it into the form of guano.

"Packing guano in bags or suitable cases.

"Lifting same from tanks, and delivering into wagons, trucks, &c., for agricultural purposes."

* * * *

"The preparation of the remainder of the sewage (after draining off the liquid part of it) so as to deliver it in the form of a dried solid and utterly inodorous guano-like manure, or 'British guano,' as it may be well termed, constitutes the second part of the sewage treatment, and which is now to be described.

"The comparatively solid portion of the sewage remaining in the form of a thin stratum of a tolerably uniform and paste-like consistence over the bottom of each tank after the last draining-off of the liquid sewage, has to be mixed and dried—mixed with the coal ash and gypsum, or other similar material (which may have become saturated or partly impregnated with the volatile gases,) and dried by the application of heat. This mixing is considered desirable not only for deodorising the sewage, but as a mode of profitably using the saturated materials without impairing or injuriously moderating or qualifying the high forcing and fertilising powers of the solid manure.

"It is proposed, as the most ready method of effecting this mixing, that a small quantity of the coal ash and gypsum, &c., shall be permitted to escape from the boxes over the tanks, and falling through each of the tanks to become deposited as a thin bed or film over the surface of the bottom of the tank before the sewage is admitted. This sprinkling of the coal ash, &c., may be repeated occasionally during the settling process, by which these materials will descend with the solid particles of the sewage, and become incorporated with the accumulating solid mass in the bottom of the tank. The construction of the coal-ash boxes has been already described as being such that this gentle liberation of the lower and more saturated parts of the coal ash, &c., can be readily effected at such times and in such portions as may in practice be found adapted to produce solid deodorized manure, or 'British guano,' of the best quality for agricultural purposes.

"The drying of the solid and mixed mass in the bottom of the tanks is proposed to be effected by the application of heat by means

of the circulation of hot water, air, or steam, within coils of piping placed around and within the tanks. This heating will commence immediately after draining off the liquid matters, and a final sprinkling of coal ash, &c., has been deposited over the solid stratum. The heating will proceed until all the moisture of the mass is evaporated, and it is thoroughly dried into the form of a solid stratum or slab, of more or less tenacity. In this condition the mass will be scraped from the bottom of the tank, and put into grinding or crushing-machines. These machines may be fixed upon platforms, that should descend into the tanks as soon as the manure has become thoroughly dried. Four labourers (convicts, if employed) might descend with each machine on its platform, and connect it by a band with a shaft worked by the steam engine, having first scraped up the manure and filled the machine. When delivered from the machine, the ground manure would be by the same labourers filled into bags, to be raised to the ground surface by cranes worked by hydraulic power or by the steam engine. These air-tight bags or cases will each hold a definite quantity or weight of the dried inodorous solid manure. During this grinding and packing, the heat will be withdrawn from the tank in which these operations are proceeding, and be transferred to the next in succession of the tanks, where a similar series of processes will be performed.

"The grinding and packing having been performed at the bottom of the tank, the bags of 'British guano' are raised to the surface of the ground, or ground level of the building, and are there delivered into trucks or wagons for conveyance to the places where required. This raising is performed either by the steam engine or by hydraulic cranes worked by the water from the summit reservoirs or tanks at the top of the tower."

The site for this apparatus is to be 200 feet in length, and 100 feet in breadth, and a depth of 68 feet below the surface of the ground; in this space the whole of the water is to be filtered from the sewage, pumped up to a high tower, as a level from which to supply streets, courts, urinals, closets, &c., or fire-engines! The author states that convict labour may be employed in these operations. We apprehend that it would be difficult to people such a hole by volunteers. Model lodging-houses are to be built over these pits; and the author states:

"No apprehension need be felt that the sewage operations below would occasion exhalations offensive or injurious to the inmates of the lodgings above. The protecting covering of coal ash and other deodorisers, and the mode of conducting the several processes, would effectually obviate any nuisance of this kind; while the lofty height of the building, the great extent of frontage, the solidity of the foundation, the convenience of the steam power for working a hoist for raising all coals and other heavy stores, the useful command of an ample supply of clear inodorous water for such purposes as it is fitted for, the liberal provision of gas, water, and all other sources of domestic convenience, would all conduce to render the buildings here proposed eminently desirable as lodgings for the working population of the district. According to the plan shown in fig. 8, twenty-four sets of apartments are provided on each floor; and supposing the building to contain five of these floors or stories, 120 sets would be comprised in the whole. An average of four individuals to each set of apartments, gives 480 individuals, for whom each of these buildings would furnish comfortable accommodation. As a question of pecuniary success, it is well known that buildings devoted to this purpose and properly conducted are uniformly remunerative, and may be profitable."

The author would almost appear to consider his plans so perfect that a given quantity of water being supplied to the lodging-houses at the beginning of the year, it might be used and deodorised, and used again, from year's end to year's end, only requiring to provide for evaporation.

We have rarely seen a proposition for manufacturing effluvia more complete than the following: the author's love of manure seems to outweigh all other considerations.

"In order to complete the cleansing of towns it will be necessary to remove in the most effectual manner, and to manufacture into valuable manure, without the escape of effluvia, every description of animal refuse, including the offal of dead animals, entrails of fishes, and contents of slaughter-houses—in short, every description of the most noxious animal and also vegetable refuse. The removal of all this could be effected by covered vans made air-tight, and by which it might be conveyed to pits excavated in the sewage district for the purpose. If this removal were made with regularity two or three times in the week, the refuse would not become putrid or decayed, or emit the noxious effluvia which it would if allowed to remain for longer periods.

"The pits should be five in number; four to contain animal and vegetable refuse, the fifth, or central one, to contain street-sweepings or other deodorising material. Each of the four pits should be large enough to contain one month's refuse of the district. To render the system intelligible, the author will suppose each pit to be 100 feet by 20 feet, and 20 feet deep. Over

the top of this pit an open railway should be constructed, upon which the covered vans should be driven, and their contents emptied through the bottom of them. A similar construction is proposed over each of the five excavations, and over this basement story a superstructure 15 feet high is to be raised. The order in which the refuse matter should be placed in the pits is as follows:—1 foot in thickness of dry and sifted street-sweepings should be placed at the bottom of the pit. Over this, 1 foot of stable dung should be spread, treading it down carefully; 6 inches of animal and vegetable refuse should be placed on this layer of stable dung; another layer of stable dung, 1 foot thick, should now be spread over the refuse, treading it down carefully as before, and over this should be placed 6 inches of street-sweepings, the surface of which should be spread evenly and rolled. Over this a layer of dung, 1 foot thick should be placed, treading it down carefully as before; then a layer, 6 inches thick, of refuse as before; then another layer of dung, 1 foot thick, and then 6 inches of street-sweepings. Exactly the same process should be carried on as before, until the pit is full, when it should be crowned with 18 inches of street-sweepings. During the process of filling the pit, care should be taken to finish the day's work with the layer of street-sweepings, so as to prevent the possibility of the escape of effluvia from any of the ingredients when once deposited within the pit.

"The elaboration of these layers of heating and cooling matter may be thus described:—The vapour caused by the fermentation of the animal and vegetable refuse and the stable dung would be imprisoned or retarded, and perhaps chemically fixed by the cold, dry, and sifted street-sweepings. As the fermentation gradually cooled, the vapour would become gradually condensed in, and deodorised by the street-sweepings. In three months, if this heap were opened, it would be found to be one homogeneous mass, resembling black butter; it would be impossible to distinguish the dung from the animal and vegetable matter, or the latter from the street-sweepings. It would be one of uniform black colour, and as inodorous as the usual farm-yard dung. It would be found much more fertilising and lasting in its effects than the very best description of farm-yard manure, inasmuch as none of the effluvia of ammoniacal vapour could escape, being fixed and condensed by the layers of street-sweepings, and thus incorporated into the whole mass.

"The open railway over the top of the pits would much facilitate the emptying; and if intervals were left between the pits, similar to the intervals described between the sewage tanks, cranes could be worked by hydraulic power which would further facilitate the operation of emptying. As the condensation of the ammoniacal vapour would render this manure soft and plastic, it is probable that by hydraulic pressure it might be compressed into blocks which would make it much more portable than the usual form of farm-yard manure. It is to be observed that only the basement and ground stories are required for carrying on those operations. Buildings for any purposes might be erected over the pits, and their roofs could be converted into reservoirs for filtered water, which might be useful for working cranes or other machinery by hydraulic power, for extinguishing fires, and for many other purposes."

We trust that when the author brings this to bear, he may be sentenced to live over the pit, with an ample supply of the filtered water for all his uses, unless he shall construct it in some uninhabited neighbourhood. The "black butter" would be something like the manure heaps of a certain cow-keeper, which formerly asphyxiated the neighbours on their opening. The work is that of a writer who seems to have gleaned his ideas from the blue books of Mr. Chadwick, and has reproduced them in the most crude shape.

We believe that the ultimate method of dealing with the exuviæ of dwellings will be chemically as well as mechanically, so as to render removal at any time unobnoxious, and to insure the proper dealing with it, as we have said, by making it a perquisite of servants or others. It is a very practicable thing to construct efficient galvanised tanks, in which the chemical change may be produced. The chief difficulty has been in our resort to water as our general cleanser, which dilutes and weakens the exuviæ, and overflows the deposits, and ultimately pollutes the river. If proper chemical disinfectants were used, the water would not be required.

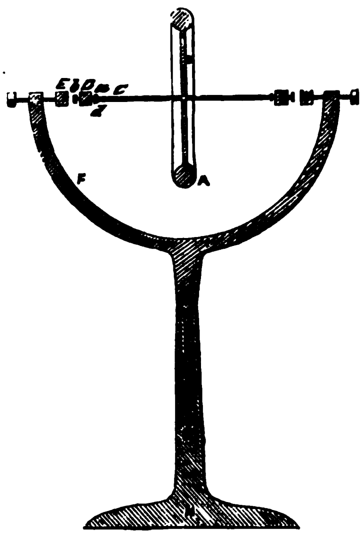
On a railway near London a large free-school was erected. The exuviæ were used to manure some garden ground in which the boys worked; but they did not require the whole. A nuisance was created, and the trustees of the school were threatened with prosecution. They then placed peat charcoal in the cesspool. The nuisance was abated, and the liquid proved an innoxious clear stream, from which, at some distance, a pic-nic party, unconscious of its source, were supplying themselves with diluent.

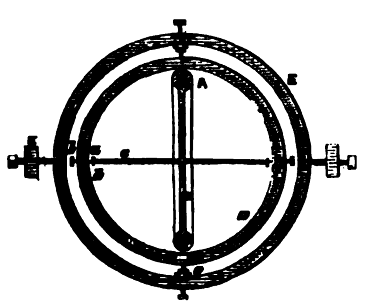
Probably better and more manageable things than peat charcoal may be found,

and it would not be difficult to imagine a far better system of lubrication for closets, to prevent adhesion, than yet prevails.

FOUCAULT'S EXPERIMENTS WITH THE GYROSCOPE.

M. Foucault, the author of the celebrated pendulum experiment, by which the motion of the earth was made apparent to the eye, read an important paper at the last meeting of the British Association, on "Nouvelles Expériences sur le Mouvement de la Terre au Moyen du Gyroscope." The experiments brought before the Association by M. Foucault on that occasion were of a





very striking character, and elicited a request from the Section that they should be repeated before the assembled Association *at one of the* evening meetings, as they accordingly were. The following illustrated description of the instrument is from the April number of the *Civil Engineer and Architect's Journal.*

"In the accompanying engraving of the gyroscope, A is a section of the periphery of the wheel, A A, which is constructed with a very heavy rim or periphery, and a light disc, BB, forming the arms by means of which the connection is made to the axis, C C, of the wheel. This axis is hung or connected to a ring, D D, by means of gymbal journals at *a a;* this axis at each end being brought to a conical point and dipping into the conical recess made in the end of the bolts, *b;* which bolts being screwed, pass through the brass hoop or ring, and are secured steadily by the jam-nut, *d*, in the position which permits of the free revolution of the axis, C C. This ring, D D, again is hung or connected to the brass ring, E E, by means of gymbal suspensions at *e e*. These gymbal suspensions are constructed in the same way (with bolts and jam-nuts) as those described suspending the axis, C C, of the wheel, A A. Again, this ring, E E, is suspended to the upper part, F F, of the stand, by another pair of gymbals similarly to the others. The box, F F, or upper part of the stand is provided with a prong, G, or long pivot, which dips into a socket on the top of the lower part of the stand, H. The apparatus so made is thus capable of the following motions:—The wheel, A A, is capable of revolution on its axis, C C, within the ring, D D; the ring, D D, including the wheel, A A, is capable of revolution within the ring, E E, round the gymbal suspensions, *e e;* the ring, E E, is again capable of revolution within the box, F F, or upper part of the stand, round the gymbal suspensions that connect it to the frame or stand; and finally, the whole apparatus is susceptible of revolution horizontally on the pivot, G, which is inserted into the socket of the stand, H."

The same journal then goes on to say: "With the apparatus so constructed, a variety of beautiful experiments can be performed, of which the following are the more interesting. Remove the ring, D D, carrying the wheel, A A, from the machine, set the wheel A A in rapid motion, which can be done by winding a piece of twine round the axis of the wheel, A A, and while holding the ring D D firmly in the hand, pull the twine violently, so as to uncoil it from the axis, C C; suspend the ring D D by a piece of line attached to itself, or what is better, to the projecting head of the bolt which is outside of the ring at the gymbal journal; and so long as the velocity of the wheel, A A, exceeds a certain amount, the

ring D D will stand horizontally, though suspended on one side, or it will remain in any position forming an angle with the horizon in which it may be placed; and while so suspended will slowly revolve round the suspending twine as a centre of motion. Thus the revolving motion of the mass of the wheel and axis resists the action of gravity on the mass, both of the matter which is in motion and on that which is at rest.

"Another experiment is as follows: Place the ring, E E, perpendicular, the ring, D D, at right angles to it; set the wheel, A A, in rapid motion in the same way as before, and assuming that while the machine is at rest it is in exact equilibrium, suspend while it is in motion a small weight on the projecting head of the bolt, which forms the axis of the wheel, and a horizontal revolution of the whole mass round the pivot centre of the stand will take place. Suspend now a heavier weight at the other end of the axis of the wheel, and the motion will be reversed; that is, if with the light weight the revolution took place to the right or left hand, it will, after the addition of the heavier weight at the opposite end, revolve to the left or right hand, the directions being determined by the direction in which the wheel A A revolves.

"A third very interesting experiment is the following:—When the whole machine is at rest, if a stand be slowly turned round on the table, the whole mass will turn with it, the weight of the machine causing sufficient friction on the pivot to produce this effect; but set the wheel in rapid motion as before, and the stand may be turned either way without disturbing the upper part of the machine, or altering the absolute direction of the axis of rotation. Thus, as with the pendulum experiment, can be shown the actual revolution of the earth, seeing that as the revolution of the earth takes place, it slowly revolves round under the gyroscope, the axis of which retains the same absolute direction in space. Instead of the ring, D D, being used to carry the axis of the wheel, A A, a semi-sphere is sometimes substituted, and in this form if the cup or semi-sphere be carried in the hand, the resistance which the moving mass offers to any change in the direction of the axis of rotation opposing any horizontal or perpendicular angular motion in the axis, gives the sensation as if the inanimate matter possessed life and a will of its own."

The following account of the proceedings before the Section of the Association is from the *Athenæum*, No. 1406:

"The author spoke in French, but very distinctly, and the apparatus was so simple, beautiful, and exquisitely constructed, that the experiments all succeeded to a miracle, and fully interpreted the author's meaning as he proceeded. The gyroscope is a massive ring of brass connected with a steel axis by a thinner plate of the same metal, all turned beautifully smooth, and most accurately centered and balanced; in other words, the axis caused to pass accurately through the centre of gravity, and to stand truly perpendicular to the plane of rotation of the entire mass. On this axis was a small but stout pinion, which served when the instrument was placed firmly on the small frame, containing a train of stout clock-work, turned by a handle like a jack, to give it an exceedingly rapid rotatory motion on its axis. But to this clock-work frame it could be attached or detached from it instantly. This revolving mass was only about 3 inches wide, and four of them were mounted in frames a little differently. The first was mounted in a ring, attached to a hollow sheath, which only permitted the axle and the pinion to appear on the outside, so that it could be laid hold of, or grasped firmly in the hand, if the pinion were not touched, while the mass inside was rapidly revolving without disturbing that motion. By this modification of the gyroscope, the author afforded to the audience a sensible proof of the determination with which a revolving mass endeavours to maintain its own axis of permanent stable rotation, for upon setting it into rapid rotatory motion, and handing it round the room, each person that held it found himself forcibly resisted in any attempt to turn it round either in his fingers, to the right hand or left, or up or down, or in his hands if he swung it round. So that the idea was irresistibly suggested to the mind, that there was something living within, which had a will of its own, and which always opposed your will to change its position. The second modification presented the mass suspended in a stout ring, which was furnished with projecting axles, like the ring of the gymbal. These axles could be placed in a small frame of wood bushed with brass. This small frame, when placed on a piece of smooth board, could be turned freely round by turning the piece of board on which it rested as long as the gyroscope was not revolving, friction being sufficient to cause the one to turn with the other; but, when the gyroscope was set rapidly revolving, in vain you attempted to turn the frame, by turning the board on which it rested, so determinately did it endeavour to maintain its own plane of rotation, as quite to overpower the friction. In the third modification of the gyroscope it was suspended in gymbals, so exquisitely constructed that both the gyroscope proper and the supporting gymbals were accurately balanced, so as to rest freely when placed in any position in relation to the earth. By

this conclusion. But whilst
on the attentive consi-
be felt bound to
from the
e
e
ie

ount
f the
tine of
work of
h, com-
estone, of
bank, and
north bank,
ideway being
ans, a centre
e spans of 138
rear, at a height
r of spring tides.

EED APPARA-

ruary 2, 1854.)
of Piccadilly, has pa-
hich consists of certain
ments to be employed
supplying steam boilers
vessels with water. The
ecting this object consists
ndrical vessels closed at the
n, and connected by a pipe
a two valves, each having four
seat and two in itself, so ar-
two are always open and two
o each of the valves are secured
which communicate with the
One pipe from each valve is carried
boiler, one entering the lower part
and the other the upper; the first
ying steam into the cylindrical vessels,
the other conveying water from them
the boiler. One of the other two pipes
nected with the valves conveys the water
om the well or reservoir to the cylindrical
essels before referred to; while the other
carries away the steam from the vessels to a
condenser.

The engraving on the following page represents a front elevation of the apparatus. A A' are a pair of cylindrical metallic vessels, made of copper, and firmly bolted together to withstand the pressure of steam; they are furnished with pistons or floats, Y Y', to prevent the steam from touching the surface of the water and becoming condensed, and are supported by the pipes, B, B', and C, C', which are secured to the valves D and E, which are fixed to the pillar or stand, F. G is ice-pipe communicating with t , from which the supply of c awn

nd
ere
your
nded
set at
ned the
ting the
hat both
derations

this the author showed most strikingly the effect of any attempt to communicate revolving motion round any other axis to a mass already revolving, for, on placing the gymbals in a frame of wood while the gyroscope was not revolving, it remained quite steady; but, when thrown into rapid revolving motion, the slightest attempt to turn the frame round to the right or to the left was instantly followed by the entire gyroscope turning round in the gymbals, so as to bring its axis to coincide with the new axis you endeavoured to give it, with a life-like precision, and always so as to make its own direction of revolution be the same as that of the slightest turn you impart to it. Having thus demonstrated the necessary effect of combining one rotatory motion with another, he then proceeded to demonstrate palpably that the earth's revolving motion affected the gyroscope in precisely a similar way. Having, by the screw adjustments, brought the gyroscope, in gymbals, to a very exact balance, it remained fixed in any position when not revolving. But, rapid rotatory motion having been communicated to the gyroscope mass, as soon as the gymbal supports are placed on the stand, you see the entire apparatus, slowly at first, but at length more rapidly, turn itself round, nor ever settle until the axis, on which the gyroscope is revolving, arranges itself parallel to the terrestrial axis, in such a sense as to make the direction of the revolving gyroscope be the same as that of the whole earth. He next showed that the determination with which it did this was sufficient to control the entire weight of the instrument, though that amounted to several pounds, for, taking the ring gyroscope, from the side of the ring of which a small steel wire projected, ending in a hook, the wire coinciding with the prolongation of the axis of the gyroscope; of course, when not made to revolve, the hook, if placed in a little agate cup at the top of a stand, would permit the instrument, by its weight, to fall instantly, as soon as the support of the hand was taken from it. But upon imparting to it rapid rotatory motion, it stood up even beyond the horizontal position, so as to bring its axis of rotation nearly to the same inclination to the horizon as the axis of the earth, while the whole acquired a slow rotatory motion round the point of the hook; and so steady was its equilibrium while moving thus, that a string being passed under the hook and both ends brought together in the hand, the whole may be lifted by the cord off the stand and carried revolving steadily about the room. Next, to show the motion of the earth sensibly, he placed the gymbal gyroscope suspended freely by a fine silk fibre in a stand with the lower steel point of its support resting in an agate cup; a long light pointer projecting from the ring carried a pointed card which passed over a graduated card arch of a circle placed concentrically with the gyroscope; upon imparting rapid rotatory motion to the gyroscope the index was seen as the earth moved to point out the relative motion of the plane of rotation exactly in the same way: the law of the motion being also the same as that of the well-known pendulum experiment. Lastly, he set the ring gyroscope in motion, and by placing a small pointed piece of brass at the end of the axle on the ring, the instrument went immediately through all the evolutions of a boy's top on the floor, humming meanwhile loudly also."

ON THE DISTRIBUTION OF MATERIAL IN WROUGHT-IRON BEAMS.

THE paper read at the Institution of Civil Engineers, on the evening of Tuesday, April 24, was—"On the Economic Distribution of Material in the Sides or Vertical Portions of Wrought-iron Beams," by Mr. J. Barton, M. Inst. C.E.

It was stated that, in the various investigations upon wrought-iron beams which had been submitted to the profession, comparatively little attention had been given to the part which the vertical portion of the beam had to perform, or to the elimination of the laws governing the strains in the sides, or the mode by which, on the application of a weight at one point of the vertical portion, the strain was resolved into a variety of strains, of known direction and intensity, in the top and bottom webs.

The systems of construction most generally used were shown to be the tubular or plate beam, the Warren girder, and the lattice bridge, the latter being the least represented on a large scale until the recent construction of the Boyne Viaduct.

An investigation was then made of the direction of the strains in plate beams, with and without vertical stiffening pieces, with the object of showing that the only supposition which could give true results as to the horizontal strains in the top and bottom, was that the strains were diagonal through the vertical portion, and alternately tensile and compressive. This view was sustained by quotations from Mr. E. Clark's work on the Conway and Britannia bridges, and from the experiments on the model tube, where the undulations in the sides showed diagonal strains at an angle of about 45°, crossing each other at right angles. The calculation of Warren's girders by Mr. C. H. Wild were then alluded to, and the mode of calculating the strains in the bars of lattice beams was investigated in detail, and a formula was given, deduced by the author, for arriving

at correct results, either for a fixed uniform load, for a passing load, or for the ordinary case in practice—a load partly constant and partly passing; the formula giving the maximum strains of compression and tension in each case to which each bar was liable.

A comparison was then entered into of the three systems—1st, as to the amount of material required under each; and 2ndly, as to the comparative practical advantages of construction in each case. The amount of material theoretically required in each of the three systems was shown by diagrams, in which, by a geometric representation, the area of material was given, and the results arrived at appeared to be, that if the material in a theoretically perfect plate beam was represented by 100, the Warren girder would only require 73, and the lattice 67; or, in other words, that the lattice saved 33 per cent. of material as compared to that of the plate or tubular beam, and the Warren saved 27 per cent.; the lattice requiring 6 per cent. less than the Warren, chiefly from the fact of the angle of 45° being employed instead of 60° in the inclination of the bracing. It was argued also that, in the above consideration, the tubular girder was placed in too favourable a position, taking into account the position assumed by Professor Haupt, in a paper before the American Institute, in July, 1853, where it was asserted that a plate could not theoretically act, within a large per centage, to the same advantage as a bar for tension in the side of a beam between vertical stiffeners.

Among the practical considerations, the price per ton was stated to be in favour of the lattice beam. The facilities which each system gave for so arranging the parts in compression that they would resist flexure, were examined, and an explanation was given of a mode devised and adopted by the author in the Boyne and other bridges, by which the struts themselves became lattice beams, instead of mere bars, so that great rigidity was obtained. The presumed loss of strength from rivetting together the lattice work was shown not to exist, as it was in no way more rivetted per ton than the plate beam, and also, as by means of a mode of rivetting devised by the author, the loss of area need never exceed one small rivet at any junction of two bars or plates.

The facilities for repairs and painting, and the small surface exposed to storms, were assumed as additional advantages in favour of the lattice system.

On these grounds the author contended that intersecting systems of bracing, set at an angle of 45° to the horizon, formed the most economic mode of constructing the sides of wrought-iron beams, and that both theoretical and practical considerations pointed to this conclusion. But whilst urging the subject on the attentive consideration of the profession, he felt bound to acknowledge that it was only from the advanced ground already occupied by those who had investigated the question of the tubular and the Warren girders, that he endeavoured to go somewhat forward in the present investigation.

In an appendix to the paper, an account was given of the principal features of the Boyne Viaduct, at Drogheda, on the line of the Dublin and Belfast Railway, a work of about one-third of a mile in length, composed of twelve arches of blue limestone, of 61 feet span each, on the south bank, and of three similar arches on the north bank, resting on slender piers, the tideway being crossed by three lattice beams, a centre span of 264 feet, and two side spans of 138 feet 8 inches each, in the clear, at a height of 90 feet above high water of spring tides.

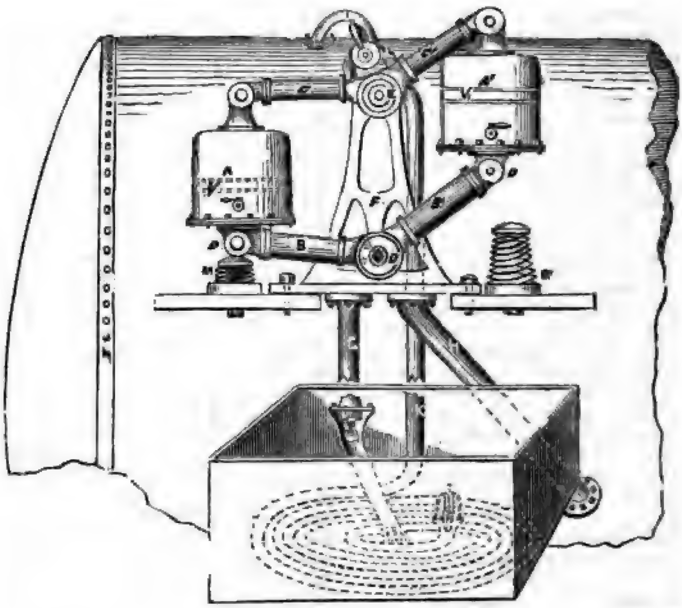
SYKES' PATENT FEED APPARATUS.

(Patent dated February 2, 1854.)

Mr. F. H. Sykes, of Piccadilly, has patented an invention which consists of certain mechanical arrangements to be employed for the purpose of supplying steam boilers and other similar vessels with water. The apparatus for effecting this object consists of a pair of cylindrical vessels closed at the top and bottom, and connected by a pipe furnished with two valves, each having four ports in its seat and two in itself, so arranged that two are always open and two closed. To each of the valves are secured two pipes which communicate with the ports. One pipe from each valve is carried into the boiler, one entering the lower part of it, and the other the upper; the first conveying steam into the cylindrical vessels, and the other conveying water from them into the boiler. One of the other two pipes connected with the valves conveys the water from the well or reservoir to the cylindrical vessels before referred to; while the other carries away the steam from the vessels to a condenser.

The engraving on the following page represents a front elevation of the apparatus. A A′ are a pair of cylindrical metallic vessels, made of copper, and firmly bolted together to withstand the pressure of steam; they are furnished with pistons or floats, Y Y′, to prevent the steam from touching the surface of the water and becoming condensed, and are supported by the pipes, B, B′, and C, C′, which are secured to the valves D and E, which are fixed to the pillar or stand, F. G is the service-pipe communicating with the reservoir from which the supply of cold water is drawn.

H is the pipe which conveys the water from the vessels into the boiler; I is a pipe by which steam is carried from the boiler into either of the supply-vessels; and K is a steam pipe terminating in a coil, which is placed in the reservoir for the purpose of condensing the steam within the supply-vessels A, with each of which it is alternately in communication. L is a bridge-cock, by which both the vessels, A, A′, may be filled with steam prior to starting the apparatus. The water pipes, B, B′, and steam pipes, C, C′, are fitted at the end, which communicate with the vessels, A, A′, with joints through each of which an aperture is bored for the passage of the fluids. Beneath the vessels, A, A′, and in a line with the base of the valve, D, are placed a



pair of buffers, M, M′, which form an elastic support for the vessels, A, A′, as they alternately descend. This apparatus is intended to be fixed on a level with the water in the boiler. "When the water within the boiler," says the inventor, " is at the boiling temperature, the apparatus for the further supply of water to the boiler may be brought into action; the bridge-cock, L, is opened, by which the steam is admitted to and fills both the vessels, A, A′, with steam, in order to drive out the air; the steam is then to be shut off; the steam pipe, K, is in communication through the valve, E, with the upper vessel, A′, and the service-pipe, G, is through the valve, D, likewise in communication with the lower part of the vessel, A′. As the steam from the boiler passes down the pipe, K, it is rapidly condensed; the partial vacuum thus created within the vessel, A′, causes the service-water to rush through the pipe, G, thence through the valve, D, and pipe, B′, to the vessel, A′, which, when filled, or nearly so, will descend and lift the vessel, A, and this descent opens and shuts the valves. This play will continue according to the want of water in the boiler, and the apparatus will keep the boiler supplied with water always at one level, independent of the engine."

The inventor also proposes to employ the apparatus for raising and forcing liquids for other purposes.

ON THE PRODUCTION OF DAGUERREOTYPES WITHOUT LENSES.

[The following remarks occur in a paper, *written by J. F. Mascher*, Esq., of Philadelphia, and published in the *Scientific American* of April 21st.]

I send you with this two stereoscopic pictures, taken by me by means of a box, to be described hereafter, which contained neither lenses, reflectors, nor any refracting or reflecting medium of any kind.

I accidentally made the discovery that photographic pictures could be taken in this manner, while prosecuting some experiments relative to stereoscopic angles.

It is well known that two pictures, taken with two ordinary cameras, placed only 2½ inches apart horizontally, will not, when placed in the stereoscope, show proper or sufficient stereoscopic relief; and yet it is well known that the human eyes are only placed 2½ inches apart, and see solid objects in their proper solidity and relief. To explain the why and wherefore of these facts, has challenged the attention of Professor Wheatstone, Sir David Brewster, and a host of others; leading the above-named gentlemen into a very sharp controversy, leaving the main question—the determination of the proper stereoscopic angles—as far as practical results are concerned, in precisely the same condition in which they found it.

Under the circumstances, we may be permitted to ask, why is it that two pictures, taken by two cameras placed 2½ inches apart, do not show sufficient stereoscopic relief? Why is it that we must place the cameras about eight times further apart than the human eyes, in order to produce the proper relief? When these questions first suggested themselves, the following answer occurred to me (without, at that time, being able to prove it to be the correct one), namely, "Because the lenses in the camera (quarter size) are twelve times larger than the human lenses (eyes)."

In order to ascertain whether this was the correct answer or not, it was only necessary to take two pictures with two cameras, having a diaphragm in each, the openings of which were one-eighth of an inch in diameter, that being the diameter of the diaphragm of the human eye. In executing this experiment, I was very much surprised to find that the focal range of the camera was increased to an extraordinary extent. The cameras had been focussed for a house on the opposite side of the street; but the moment the diaphragm was introduced, the sash in the window, which before was invisible, suddenly became as sharp and distinct as the house on which the focus had been previously drawn. Subsequently, on removing the camera to an upper story of my house, it was found that this increase in focal range extended not only from the house towards the camera, but also to an equal extent beyond the house. After ascertaining these facts, it became desirable to find out the causes of them. With this end in view, the lenses were removed from the tube, and only the diaphragm remained in it. You may well imagine my astonishment at finding the pictures of houses and other objects in the street, faithfully depicted upon the ground glass! The letters of signs, &c., were reversed precisely as if lenses had been used. The next step was to ascertain whether these pictures possessed photogenic properties, which was soon done by substituting a metal diaphragm with an aperture of one-fiftieth of an inch in diameter, for the paper one of one-eighth of an inch in diameter, putting in a coated plate, allowing it to remain for fifteen minutes, and coating it with mercury in the usual manner. The result was a beautiful picture, similar to the one I herewith have sent you.

It was self-evident now that we had the means to do that with one camera, for which two were before deemed indispensable; namely, taking two stereoscopic pictures through two apertures situated only 2½ inches apart; but as a quarter-size plate is only 4¼ inches long, and as it was desirable to take the two pictures on one plate, two apertures, 1-66 of an inch in diameter, were made in the metal plate above alluded to, only 2½ inches apart. After twenty minutes' exposure, the sun shining on the house all the time, the pictures which I send you were the results; thus demonstrating conclusively that two stereoscopic pictures can be taken on one plate, with one camera (or dark chamber without lenses), and simultaneously, without either reflectors or refractors of any kind whatsoever. It may here be remarked, however, that the pictures thus taken on one plate are stereoscopic reverse; that is to say, the right picture is on the side where the left one ought to be, and *vice versâ*, which can, however, be very readily remedied by cutting the plate in two and pasting them together again properly. This stereoscopic reverse was next attempted to be remedied by placing a reflector before the apparatus; but the only effect produced by this device was the same as the reflector produced upon pictures taken by an ordinary camera, viz., making the pictures appear in their natural position, so that letters on signs, &c., could be read correctly.

There is another advantage resulting from this camera; it is this: you may make two, four, six, or more sets of holes in the same camera, either all of the same diameter, by which means you will obtain an equal number of stereoscopic pictures with the number of sets of holes; or you may make one set with an aperture 1-200 of an inch, another 1-100 of an inch, one set 1-70 of an inch, and still another set with 1-25 of an

inch diameter; when you will be almost certain to obtain at least one set of pictures properly "timed," especially as the other pictures, which are not properly timed, can be rubbed out before gilding, thus saving the plates.

INTERCOMMUNICATION IN RAILWAY TRAINS.

On Saturday last a trial of the invention of Mr. H. Wickens, of Tokenhouse-yard, London, for effecting a communication between the driver and the guard on a railway train was made on the Windsor train of 12 carriages on the South-Western line, in the presence of Lieutenant-Colonel Wynne, railway inspector from the Board of Trade, Mr. H. R. Williams, of the Board of Trade, Mr. J. Beattie, engineer of the line, Dr. Spurgin, Mr. Wickens, and others. The invention is remarkable for its simplicity, and the impossibility of its being put out of order, however rapid the rate of speed, or great the oscillation of the engine or carriages, and is applicable to a train of any length. It consists of two small portable boxes, one of which is placed at each end of the train; into each box is fixed a short piece of India-rubber tubing, which is connected with the end of a small tin or other tube, fixed under each carriage, which, by means of secure coupling joints fitting each other, and so arranged as to admit of any elongation or variation in the train under any circumstances, can be instantly attached or detached to or from the next carriage. In each of these boxes is fixed a very simple, but very efficacious apparatus, which being worked by a handle outside the box, a loud and shrill whistle is emitted from the driver at the one end to the guard at the other end of the train, or from the guard to the driver, as may be necessary. The code of signals is of equal simplicity with the rest of the invention, and may be understood without difficulty and worked by anybody, one whistle meaning, "Go on—take off breaks;" two whistles, "Slacken speed—look out;" three (danger signal), "Stop—reverse engine—put on breaks;" four (speed signal), "Go faster—behind time—another train following," &c. Each whistle is caused by one separate pressure of the handle of the box. The advantages of this invention are its inexpensiveness: (for the entire cost of its permanent application to the whole rolling stock of a company would be less than that occasioned by one serious accident;) the great security it will afford to passengers; *the rapidity of* its operation, the *communication being* **instantaneous**; and its exemption from the accidental disarrangement to which more complex and delicate apparatus is exposed in the transit of a train, more especially if a heavy one, over 4,380 feet of rail per minute, a pace at which trains sometimes travel, and which rapidity of motion would render the delay necessary in some modes of communication that have been suggested by cords or wires very problematical. The communication by electricity, and the signal by electric clocks, however important and extraordinary, seem less calculated for the communication with one end of a train in rapid motion with the other end than this more unpretending invention, the simplicity of which is more suitable to the capacities of the people by whom it is to be worked than more scientific arrangements. By a very trifling addition to the construction the communication is also conveyed from any of the carriages to the guard. The result of the trial was entirely satisfactory, the invention fully performing what was claimed for it. The public will learn with satisfaction that the Government are about to bring in a bill compelling railway companies to adopt a communication along the trains, by which security from danger may in future be afforded to passengers.

The Screw Propeller. A Letter to Captain G. T. Scobell, R.N., M.P. With Documents relating to the Invention of the "Screw Propeller" used in the Royal Navy, and to the misapplication of the Grant of Twenty Thousand Pounds "Remunerative Compensation" voted by the House of Commons. By Captain E. J. Carpenter, R.N.

The recent agitation in the morning papers, having for its object the presentation of a national testimonial to Mr. F. P. Smith, as the inventor of the screw propeller, from the use of which the Royal and Mercantile Navies of this country have derived enormous advantages, has very naturally had the effect of calling forth a re-assertion of his own claims on the part of Captain Carpenter—claims which, as our readers will remember, have been confirmed by Lord Justice Knight Bruce, on behalf of the Committee of the Privy Council.

On March 28, 1855, Captain Scobell gave notice in the House of Commons of his intention to move for a "Select Committee to inquire into the circumstances under which the sum of £20,000, voted by the House of Commons as a reward to the inventor of the screw propeller used in Her Majesty's Navy has been applied, and by whom and

to whom; and whether the said reward, or a part thereof, has been paid by the party intrusted by the Admiralty to apportion it to a person or persons not having a just claim thereto, and to the exclusion of Captain Carpenter, R.N., whose title to the invention of such screw propeller has been substantiated by a judgment, in March, 1854, of the Judicial Committee of Her Majesty's Most Honourable Privy Council."

The following is Captain Carpenter's letter to Captain Scobell:

"Sir,—Impelled by a deep sense of personal injury, and a desire to avert future infliction of public wrong, I have collected for publication the annexed documents.

"'The House of Commons voted £20,000, on account of patent rights for the "screw propeller" used in Her Majesty's ships and vessels.'

"To the Lords Commissioners for executing the office of Lord High Admiral of the United Kingdom, was entrusted by Parliament the responsible duty of the right appropriation of the grant from the public purse.

"Unsanctioned by Parliament, this important trust was delegated by the Admiralty to a private gentleman—a banker—unqualified for the office, as unknown in the scientific world, and disqualified by the interest held by him in one of the patents.

"He was one of the Directors of the Company to which this patent was conveyed,—in alliance and amalgamation of interests, with the representatives of four competing patents,—and as the organ of the coalition, he obtained from the Lords of the Admiralty, ('on his personal guarantee to Her Majesty's Government against all claims,') —possession of, and control over, the £20,000 of the public money.

"By this private gentleman, the trust was sub-delegated, to a patent agent,—the party by whom the coalition was arranged,—who had been or was then employed by, or professionally interested for, several of the five allied patentees,—and to whom was committed the award of the 'national grant!!'

"The pecuniary distribution of the £20,000, in accordance with this award, (yet unrevealed to the public,) was left entirely to the banker.

"Could no adequate talent and ability have been selected by the Lords of the Admiralty, within the Royal Society, the Royal or the Mercantile Navy of Great Britain, to form an impartial and well qualified commission, by whom, after due public notice, the intention of Parliament might have been rightfully and disinterestedly carried out? —Would the protective shield of the deed of indemnity, to which were parties the Lords of the Admiralty on the one hand, and the banker elect, with his co-guarantee on the other, have been found in unnatural association with the invention of the 'screw-propeller,' now a great and essential element of national intercourse, and a mighty engine of defensive and offensive warfare?

"In 1714, the House of Commons voted £20,000, to reward and compensate the inventors and improvers of the marine chronometer. Then Parliament appointed a commission, in which the great name of Sir Isaac Newton, President of the Royal Society, is recorded.

"Will the Parliament of the United Kingdom permit the delegation and sub-delegation of their mandate? Will the representatives of the nation sanction this unconstitutional method of award and distribution of their grant, to stand forth as a precedent, to shelter future official apathy, incapacity, or neglect of duty? Can Parliament tolerate such contempt of its will and authority? Public wrong is inseparable from private injury. Many devoted years, numerous and repeated experiments 'with the concurrence of the Lords of the Admiralty,' constant application and great outlay of very ill-spared capital, have enabled me to produce and to perfect that instrument, the 'screw propeller,' now adopted by and used in Her Majesty's Navy.

"The judicial Lords of the Privy Council, by their inquiry and recorded judgment, fully established my claims to the invention, and decided that my 'patent is in use at this day, and has for some time been in use in the Royal Navy.' (See *Mech. Mag.*, vol. lx., p. 345.)

"I have applied in vain to the Lords of the Admiralty for redress of the injury received, by the exclusion of my claims from the grant out of the public purse, and that justice might be done to my well-established right to compensation and reward.

"By the Lords of the Admiralty I was referred to the banker, to whom, under deed of indemnity, they delegated the award and appropriation of the £20,000 voted by the House of Commons, and against whom counsel learned in the law advise me that I have no legal remedy.

"To institute proceedings in the Courts of Justice against the Lords of the Admiralty, would be to involve myself in expenses that I am unable to bear, as well as to encounter the chances arising out of legal technicalities, and to contend, on unequal ground, with a public Official Board, from whom costs cannot be recovered.

"The Right Honourable Lord Lyndhurst, convinced of the justice and truth of my claims to reward and to compensation, as the inventor and patentee of the 'screw propeller,' adopted by and now in use in the

Navy, moved in the House of Lords for 'a copy of the agreement entered into by the Lords of the Admiralty, in respect of which a sum of £20,000 has been paid on account of patent rights for the "propellers" used in Her Majesty's Navy.'

"The annexed copies of his Lordship's speech, and of the agreement (deed of indemnity) with the elucidatory documents, will, it is believed, carry conviction to every unprejudiced mind that public wrong and that private injury have been perpetrated.

"To the House of Commons appertains the control and the supervision of the right award and appropriation of money grants from the public purse. In that house, I humbly but confidently seek, 'on public grounds,' the redress of the injury done to me. In soliciting your aid and support, as an independent Member of Parliament, to bring my case before the consideration of the House of Commons, I court every inquiry, I shrink from no investigation, and I respectfully hope, that the council elect of the nation will vouchsafe to entertain my claims, and to grant me relief.

"Believe me, Sir, &c.,

"E. J. Carpenter,

"Captain R.N.

"7, Bayswater-terrace,
"March 20th, 1855."

LADDER EMEUTE AT THE CRYSTAL PALACE.

To the Editor of the Mechanics' Magazine.

Sir,—In an admirably-written paper on the Crystal Palace, in the last number of the *Quarterly Review*, the writer observes that, "The watering of the plants is a task of great nicety, ensconced as they are among miscellaneous articles and materials ill-fitted to bear wet or soil, while that of watering the 324 swinging flower baskets is one of some peril. The upright *fire-escape-like-ladders*, self-sustained, are nervous tottering things for a man to find himself projected upon at 50 feet from the ground, with the additional weight of a heavy vessel of water; strong heads, therefore, prefer climbing and creeping along the girders themselves. Indeed, the *ladder* has more than once threatened to raise a *rebellion*, and *ought not to be insisted upon.*" The machine here alluded to, is an indifferent specimen of Gregory's Fire-escape ladder, patented in 1819, and described some ten years afterwards in Number 295 of your 11th volume, p. 114; certainly a most unfit instrument for the use to which it has been misapplied at Sydenham.

It is truly lamentable that such a labour of love, as liquoring lilies, lupines, and lobelias, should entail any liability to loss of life or limb to the labourers located on lofty labent ladders; and equally astounding, that "all the talents," with Sir Joseph at their head, should have been unable to devise any better expedient for safely performing this needful operation. If that popular depository of past experience, the *Mechanics' Magazine*, had been consulted, at page 50 of the 19th volume there would have been found a description of *Rose's fireman's elevator*, an apparatus much better adapted for the operation in question, and with a superadded arrangement for supplying water to the balcony from below, seems calculated to obviate all the well-grounded objections to which Gregory's ladders are unquestionably open. Telescopic tubes fitted to the sides of the sliding ladders, with screws at each end for the attachment of a small hose, the upper one furnished with a branch-pipe or rose, and the lower one attached to a small force-pump, seems to be all that can possibly be required. Antiquity, like "music, has charms," although sometimes of a very questionable character; and if Gregory's fire-ladders were adopted by the Crystal Palace authorities because they must have an "old copy"—still they might at least have had the "best edition!"

I remain, yours, &c.,

W. Baddeley.

13, Angell-terrace, Islington,
April 27, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Stansbury, Charles Frederick, of the firm of Nourse and Co., Cornhill, London. *Improved apparatus for heating buildings.* (A communication.) Patent dated October 13, 1854. (No. 2191.)

This invention mainly consists in the combination of a steam generator, a radiator, and a condenser, for the purpose of heating buildings, the connection between the generator and condenser being perforated so as to admit of the formation of a hydrostatic column balancing the pressure of steam on a certain valve, and permitting the water resulting from the condensation of the steam to return to the generator.

Barsham, William James, of Stratford, Essex, gentleman. *Improvements in machinery or apparatus for crushing mineral and other substances.* Patent dated October 13, 1854. (No. 2193.)

The inventor describes an arrangement of stamping apparatus in which the stamper head is affixed to a stem which has suitable

guides to regulate its movement, and upon which are formed or affixed teeth (or pins acting as teeth), which, in order to produce the successive lifts of the stamper, are taken into by teeth or cogs formed partly around a wheel or disc affixed to a rotating shaft.

HARRISON, JOHN, of Brighouse, York, millwright and engineer. *Improvements in the bosses applied to millstones.* Patent dated October 14, 1854. (No. 2195.)

This invention consists in a peculiar application of springs to the bosses used for driving millstones, which are at present used without springs.

HADDAN, JOHN COOPE, of Chelsea, Middlesex, civil engineer. *Improvements in the manufacture of cannon, and of projectiles for the same.* Patent dated October 14, 1854. (No. 2197.)

These improvements consist—1. In forming two or more curved grooves in the bore of cannon by means of a shaft carrying a rotatory cutter or cutters, the shaft being disposed eccentrically to the axis of the cannon, and working in a tube or bearing, which is prevented from turning beyond the extent requisite for producing the rifle turn; or in finishing the bore, or forming the grooves of rifled cannon, by means of a planing tool which slides along the cannon upon a truly formed surface of a guiding-bar or bed-plate inserted within the cannon. 2. In closing the breech of breech-loading cannon by means of a stopper inserted from the muzzle-end of the cannon. 3. Firing a number of projectiles from several cannon by means of electric wires passed down the grooves of the cannon. 4. Casting elongated shot and shell in vertical moulds, the core being supported, in the case of shells, by means of spindles or points at either end: also in casting such projectiles with a superfluity of metal (in order to produce homogeneity in them), the superfluous material being afterwards removed. 5. Producing homogeneous wads by manufacturing them in layers, or of reduced material solidified by pressure.

HOLT, CHRISTOPHER, of the New-road, St. Pancras, Middlesex. *Improvements in fastenings for the laths of iron bedsteads, couches, and other similar articles of furniture.* Patent dated October 14, 1854. (No. 2200.)

The inventor forms upon the laths two hooks, both turned in one direction, so that on desiring to remove the lath from the bedstead it is simply necessary to lift one edge of it, when the hooks will be simultaneously withdrawn from the holes in the angle-irons.

PINKNEY, ROBERT, of Long-acre, Middlesex. *Improvements in bottles, jars, and other like vessels, and in the method of stoppering them.* Patent dated October 14, 1854. (No. 2201.)

This invention consists—1. In forming a cap having two cuts or passages with an incline stop and cavity, in combination with corresponding projections in the neck of the bottle or jar. 2. In forming a cap having indentations or projections in combination with a projecting rim and passages on the neck of the bottle.

YOUNG, JAMES HADDEN, of College-street, Camden-town, Middlesex. *Improvements in brooms or brushing apparatus.* Patent dated October 14, 1854. (No. 2204.)

In carrying out this invention, which is adapted to the sweeping of streets, &c., and is an improvement upon an apparatus patented by the inventor, January 15, 1853,* the materials of which the brush is composed, instead of being fixed to a wooden axis, are bound together by wire twisted together. To the centre of this wire axis a small pulley is fixed, over which a band is made to pass, connecting it with a wheel on the outside of a containing box to the bottom of which a metal pan is hinged. The handle of the apparatus is connected to the box by means of pivots.

PAPE, JOHN HENRY, of Paris, Rue des Bons Enfants. *Improvements in the manufacture of boots and shoes.* Patent dated October 14, 1854. (No. 2205.)

These improvements consist—1. In the substitution of metal for sole leather for the under part of shoes and boots. 2. In producing elasticity by means of India-rubber introduced between the shoe and the sole and in the inside of the heel.

BISSEKER, WILLIAM JOHN, of Birmingham, Warwick, manufacturer. *A new and improved and durable method of labelling bottles, and such like vessels or articles as require, or may require labelling.* Patent dated October 14, 1854. (No. 2206.)

Claim.—"The manufacture and construction of metallic labels for bottles and such like vessels or articles as require, or may require labelling, such labels being shaped so as to fit the surface of the bottle or other vessel."

MOORE, THOMAS EDWIN, of Great Titchfield-street, Oxford-street, Middlesex, engineer. *Improvements in apparatus for sharpening knives, scissors, and other similar edged tools.* Patent dated October 16, 1854. (No. 2207.)

The inventor fixes vertically to an appropriate holding frame, by means of binding screws and washers, two square plates of properly-tempered steel, about $\frac{1}{32}$th part of an inch in thickness, and of any convenient size, with their edges more or less bevelled,

* See *Mech. Mag.*, No. 1563, p. 73.

and so arranged that the meeting sides shall be alike. The blades to be sharpened are drawn between these plates.

BONNALL, JOHN, of Spittlegate, Grantham, Lincoln, engineer. *Improvements in apparatus for holding oil for lubricating purposes.* Patent dated October 16, 1854. (No. 2208.)

Claim.—"Forming vessels to contain oil for lubricating purposes of flexible or elastic material, capable of compression to force out the oil contained therein, but with a tendency to expand again when the pressure is removed as explained."

THOMPSON, NATHAN, junior, of New York, United States of America. *Improvements in life-preserving seats.* Patent dated October 16, 1854. (No. 2209.)

This invention consists in improvements on the life-preserving seat patented by the inventor, September 18, 1854.* Instead of hinging or fixing the water-tight compartments to the sides of a seat, so that they may be opened out by being pressed against the body of the person, he permanently attaches them to the sides of the seat, and divides the top of the seat and upper water-tight compartment into two parts, which he hinges together.

BERNOT, ETIENNE, of Paris, France, gentleman. *A new machine for cutting files, which he calls "Bernot's file-cutting machine."* Patent dated October 16, 1854. (No. 2210.)

In Bernot's machine the cutting is effected by means of a graver mounted on the end of a descending lever, the action of which is controlled by a main spring, the force of which is varied by an eccentric.

WAIN, WILLIAM, of Brunswick-street, Stamford-street, Southwark, engineer. *Improvements in the construction of screw propellers.* Patent dated Oct. 16, 1854. (No. 2213.)

In carrying out this invention, the boss of the propeller is cast in one piece, with an opening through it to receive the stems of a pair of propeller blades, which are capable of being set to any required angle to suit the run of the vessel. The gearing for effecting this adjustment is contained within the boss. The stems are set in conical bushes made in two halves, and bolted to the boss.

WETHERELL, LIONEL JOHN, of Compton-street, Clerkenwell, Middlesex, civil engineer, and AUGUSTUS JOHANN HOFFSTAEDT, of Albion-place, Surrey, agent. *An improved construction of pump.* Patent dated October 16, 1854. (No. 2214.)

The improvement constituting this invention consists in the employment of a lazy-tongs arrangement of levers for transmitting the reciprocating motion of the pump-handle to the piston-rod, for the purpose of increasing the length of the stroke.

* See *Mech. Mag.*, No. 1652, p. 329.

SCHEUTZ, GEORGE, of Salisbury-street, Middlesex, gentleman, and EDWARD SCHEUTZ, of the same place, civil engineer. *Improvements in machinery or apparatus for calculating, and printing the results of such calculations.* Patent dated October 17, 1854. (No. 2216.)

It is impossible to explain the construction of this machine without an elaborate illustrated description. The following notice of it appeared in the last number of the *Journal of the Society of Arts:*

"The machine is of that class known to mathematicians as a difference engine, its calculations being made on the principle of differences. The machine is adapted for calculating tables the law of whose formation is dependent on the addition of successive differences. It not only calculates the series of numbers, but it impresses each result on a piece of lead, from which a cliché in type-metal is taken, thus producing a stereotype-plate, from which printed copies may be obtained, free from any error of composing, &c. The machine *calculates* to sixteen figures, but *prints* to eight only; and by a singularly ingenious, and at the same time simple contrivance, the eighth figure in the table is printed, not in all cases as calculated, but with a correction, when required, for the ninth and subsequent figures omitted in the table. Thus, wherever the ninth figure, as calculated, amounts to five or more, it is more accurate that the eighth or final figure in the table should be printed with the addition of one; this the machine accomplishes. By taking out certain wheels and inserting others, the machine can be readily caused to produce its results in £ s. d., degrees, minutes, and seconds, or any other series of subdivisions which may be thought desirable. The machine performs its operations, when once set to the law on which the required table depends, by simply turning a handle, without any further attention, the power required for the purpose being extremely small, not more than a child of ten years old could supply. The calculations are made, and the results impressed on the lead at the rate of about 250 figures every ten minutes, the machine being worked slowly. It may be worked much faster, but in that case there might be danger from the momentum a rapid motion would generate in the wheels."

CORNIDES, LOUIS, of Trafalgar-square, Charing-cross, Middlesex. *An improved apparatus for amalgamating the gold and silver contained in pulverized ores.* Patent dated October 17, 1854. (No. 2218.)

This invention consists in "drawing pul-

verized metalliferous ore in a thin stratum between quicksilver and a surface moving or rotating in such quicksilver, and thereby subjecting such ore to the pressure of the quicksilver proportionate to the depth thereof, and thus amalgamating the metal in such ore with such quicksilver."

ILLINGWORTH, ALFRED, and HENRY ILLINGWORTH, of Bradford, York, spinners. *Improvements in machinery or apparatus for combing wool and other fibrous substances.* Patent dated October 17, 1854. (No. 2221.)

This invention consists—1. In the application of instruments for combing out the projecting ends of tufts when they have passed through and are held by nippers which detach them from the body of material under operation. 2. Detaching tufts or portions of the material by two drawing operations for each tuft or portion. 3. The application of a transferring apparatus for turning over detached portions or tufts which have been combed at both ends and depositing them reversed upon a surface travelling in the direction of the feed. 4. The application of springs to the bottom parts of nippers used in detaching tufts, instead of, or in combination with those at the top.

DOCKRAY, JACOB, of Leeds, York, machine-maker, and JOHN DAWSON, of Holbeck, Leeds, machine-maker. *Certain improvements in machinery for raising woollen cloth.* Patent dated October 17, 1854. (No. 2222.)

In this improved machinery the cloth is caused to pass under a stretching-roller and over a pair of shields or guards which partially cover the upper surface of the card-cylinder, leaving a portion of it exposed between them, so that as the cloth is drawn over the shields a part of the surface of the card-cylinder projecting above the shields comes in contact with the cloth. The inventors also employ endless bands of wire cards.

GREEN, RICHARD, of Sydney-street, Brompton, Middlesex. *Improvements in propelling vessels.* Patent dated October 17, 1854. (No. 2224.)

Claim.—"The application of paddles or moveable axes or spindles, the motion of which is effected by cams or collars on the said axes or spindles, combined with the concentric guide-rings or rails, and the studs, pins, or rollers, for periodically changing the position of the paddles with respect to the water in which they act, whether such paddles be made to rotate continuously on their axes in one direction or to gyrate to and fro."

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Certain improvements in breech-loading fire-arms.* (A communication.) Patent dated October 18, 1854. (No. 2226.)

These improvements consist in connecting the barrel with the stock and stationary breech by means of projections on its sides, one part of each of which is circular and another part of a wedgelike form, these projections fitting within recesses in plates attached to the stock, which recesses correspond in form with the circular part of the projections, but are wider than the wedge-shaped parts, the object being to permit the rear end of the barrel to be swung up and exposed.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in preventing collisions on railways.* (A communication.) Patent dated October 18, 1854. (No. 2227.)

The inventor arranges apparatus in such manner that upon a train passing over it a piston is depressed by means of an inclined plane fixed under the engine or tender, and an electric current is put in communication with the apparatus and conveyed by means of a conducting-wire to a second apparatus signalizing the approach of the train.

GESSNER, ERNST, of Aue, near Schneeberg, Saxony. *Improvements in gig-mills.* Patent dated October 18, 1854. (No. 2228.)

This invention consists of improvements in machinery described in the specification of a patent formerly granted to the inventor, the improved machines being arranged to work with either two or one raising cylinders, and furnished with a novel arrangement of apparatus for conducting the cloth to or from the gig-mill.

HAMILTON, GEORGE, of Great Tower-street. *Improvements in obtaining soundings.* Patent dated October 18, 1854. (No. 2229.)

This invention consists in attaching by a hinge joint to the fore part of a ship or vessel, a metal bar so arranged as to trail on the bottom when the depth of water is small. To this metal bar is attached an indicator, by means of which the depth of water is indicated as soon as the ship gets into shallow water.

This arrangement was suggested in February, 1854, by Mr. Edwards, of Pembroke Dockyard; see page 180 of our 60th volume.

MASON, JOHN, of Rochdale, Lancaster, machinist, and WILLIAM ROBERTSON, of the same place, machinist. *Improvements in machinery or apparatus for preparing and spinning cotton and other fibrous substances, part of which improvements is also applicable for shifting straps, by which motion is communicated in other machines.* Patent dated October 18, 1854. (No. 2230.)

This invention consists—1. In so regulating the speed of the carriage in going in that when the spindles are bare its speed shall be lower than when the base of the

cop has been formed. 2. In a certain method of connecting the under and upper fallers, and an arrangement by which sensitiveness is imparted to the one, and the change produced on the operation of the other. 3. In weighting the faller so as to cause it to drop down during the backing off; also in raising the faller by means of a shaper plate when the carriage is at the roller beam, and in the use of friction apparatus for working this shaper. 4. In driving the cam shaft which effects the changes by means of a band or other friction apparatus which will slip while the said shaft is to be detained. 5. In the use of loose wharves upon the spindles, and of certain friction bars described in conjunction therewith. 6. In the employment of certain double-acting strap forks.

HOLDEN, HOWARD ASHTON, of Birmingham, Warwick, manufacturer. *Certain improvements in roof lamps for railway or other carriages, and for parts used in connection with the same.* Patent dated October 18, 1854. (No. 2233.)

These improvements consist in certain arrangements for keeping the cotton-holder cold; in so constructing circular roof lamps that the inner lining may be dispensed with; in uniting the cotton-holder to supply and air-tubes by union joints; in the use of a stop-cock or valve applied to the supply-pipe for the purpose of preventing the oil from flowing down to the burner while trimming; in uniting the stoppers to the reservoir of roof lamps; in employing horizontal crown reflectors; &c.

WINFIELD, ROBERT WALTER, of Birmingham, Warwick, merchant and manufacturer. *An improvement or improvements in tubes and rods used in the construction of articles of metallic furniture.* Patent dated October 19, 1854. (No. 2234.)

This invention consists in coating tubes and rods of iron with zinc, tin, copper, or other metal, or alloy, and giving a smooth or polished surface to the coated tubes by drawing them through draw plates or collars. The tubes and rods may have a higher polish given to them by any suitable polishing process, and be lacquered, varnished, painted, japanned, or otherwise ornamented.

NICOLL, BENJAMIN, of Regent-circus, Piccadilly, Middlesex, and Lombard-street, London, shirt-maker. *Improvements in shirt fronts.* Patent dated October 19, 1854. (No. 2235.)

The inventor manufactures the linen or other material to be employed for shirt fronts in strips of the width which the plaits (or the exposed or outward part of the plaits) of the shirt front are required to be, and these plaits or the exposed parts thereof he manufactures of very fine, whilst the concealed parts are made of coarser material.

MASON, SAMUEL, shoe manufacturer, and WILLIAM BEEBY, clicker, both of Northampton. *Certain improvements in the manufacture of coverings for the human leg and foot.* Patent dated October 19, 1854. (No. 2236.)

The inventor describes a mode of manufacturing a seamless blocked gaiter and riding legging, &c.

FONTAINEMOREAU, PETER ARMAND, LECOMTE DE, of South-street, London. *Improvements in the construction of grates.* (A communication.) Patent dated October 19, 1854. (No. 2237.)

This invention consists in constructing grates of two frames, each supporting a tier of moveable bars, and in providing each with two endless screws passing over the extremities of the bars and bearing on plates set at the back and the front. The two upper screws when made to rotate move the bars on the upper frame to the back of the grate, where they fall on to the lower frame, and returning to the front are elevated to their former position.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HJORTH, SOREN, of Copenhagen. *An improved magneto-electric battery.* Application dated October 14, 1854. (No. 2198.)

The main feature of this battery consists in applying one, two, or more permanent magnets of cast-iron in connection with an equal number or more electro-magnets in such manner that the currents induced in the coils of the revolving armatures are allowed to pass round the electro-magnets.

HJORTH, SOREN, of Copenhagen. *An improved electro-magnetic machine.* Application dated October 14, 1854. (No. 2199.)

This machine is composed—1. Of several hollow stationary electro-magnets, conical inside, with double poles placed in opposite directions in order to serve for double strokes, connected and fastened by means of brass rings and screw-bolts. 2. A hollow electro-magnet put together in such manner that its single parts terminate in an iron ring in which the magnetism is collected, &c.

ROSSITER, WILLIAM, of Goswell-road, Middlesex, paper-manufacturer, and MATTHEW EDWIN BISHOP, of Cannon-street West, London, wholesale stationer. *Improvements in the manufacture of pulp suitable for paper, pasteboard, and millboard, papier-maché, and other like purposes.* Application dated October 16, 1854. (No. 2211.)

The inventors take rope shakings, canvas, tow, bagging, or other similar materials used in the manufacture of paper, and reduce them to pulp in an ordinary rag-

engine, adding a certain quantity of oil and alum, or other equivalent chemical agents, for the purpose of neutralizing any tar or other matter that may be contained in the pulp; they then introduce into the rag-engine about an equal quantity of refuse tan, bark, or other vegetable matter, which may or may not have been previously reduced to pulp, and combine the same thoroughly with the rope-pulp.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *An improved apparatus for discovering the leakage or escape of gas.* (A communication.) Application dated Oct. 16, 1854. (No. 2212.)

This invention "consists in forcing a certain quantity of atmospheric air into the pipes and apparatus connected therewith, by means of a force-pump, the cocks of the burners and main cock being previously closed."

CHILD, WILLIAM HENRY, of Providence-row, Finsbury, London, brush manufacturer. *Certain improvements in the manufacture and construction of brushes.* Application dated October 17, 1854. (No. 2215.)

This invention mainly consists in combining coarse and fine hair in the manufacture of brushes.

COGHLAN, JOHN, of Craven-street, Strand, Middlesex, civil engineer. *An improved mode of signalling on railways by electric telegraph.* Application dated October 17, 1854. (No. 2217.)

In carrying out this invention a strand of wires, or a wire rope, is suspended over or at the side of each line of rails, and to the tender, or to a carriage in the immediate proximity of the engine of each train, is fixed a bar of metal, or a drum turning on an axis, which bar or drum shall be in contact with the wire strand or rope and form a metallic circuit for telegraphing purposes, suitable batteries being provided.

COLE, JOHN LAWES, of Henry-street, Salmon's-lane, Limehouse, Middlesex, engineer. *An improved construction of portable drill.* Application dated October 17, 1854. (No. 2219.)

The chief object of this invention is to provide a ready means of boring holes in gas and water mains for the purpose of attaching branch-pipes to them. To effect this the inventor provides the drill with a clamping-frame, which consists of two side bars connected to a cross bar at about the middle of their length by adjustable pins which pass through them and through holes in the cross bar.

VEAL, ARTHUR, of Oxford, bootmaker. *Improvements in the manufacture of boots.* Application dated October 17, 1854. (No. 2220.)

The object of this invention is to construct Wellington boots, and others of that class, so that they shall be capable of expanding while being drawn on to the foot of the wearer, and afterwards contracting to their original size, this being effected by the introduction of lengths of elastic webbing into the boot at opposite sides of the leg.

EASSIE, WILLIAM, of Gloucester, railway contractor. *An improved means of securing goods or loading in or on railway trucks or wagons.* Application dated October 18, 1854. (No. 2225.)

The inventor proposes to use an improved kind of latch or bar lock, chiefly applicable for the flaps of lime or coal wagons, or trucks, by which the fastening process is to be rendered easier to work and more secure than at present.

COOKE, BENJAMIN FRANKLIN, of Boston, Massachusetts, United States of America, gentleman. *An improved mode of caulking ships, applicable also to the rendering of roofs waterproof.* Application dated October 18, 1854. (No. 2231.)

This invention consists in caulking seams with a material made by introducing alum into the ingredients of vulcanized India-rubber, whereby the compound is rendered cellular after it has been subjected to heat in the well-known manner, and expands with increasing temperatures.

WHEELER, MARK, of Newton-street, Holborn, Middlesex, japanner. *An improved mode of consuming smoke arising from the combustion of fuel in furnaces.* Application dated October 18, 1854. (No. 2232.)

The inventor says, "I provide the stoker with a quantity of sawdust, or other substance which will readily absorb water, and will, when dry, burn as fuel; and when the fire is fairly alight, I throw into it after every fresh charge of coals a shovel-full of this damp substance, the action of which is that it will prevent the smoke given off from the coal from rising and passing away from the fire-place, with the gaseous products of combustion."

*** The documents of No. 2202 and 2203 are with the Lord Chancellor.

PROVISIONAL PROTECTIONS.

Dated March 6, 1855.

496. Perceval Moses Parsons, of Duke-street, Adelphi, Middlesex, civil engineer. Certain improvements in fire-arms and projectiles.

Dated March 7, 1855.

506. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of hard India-rubber, and of articles composed of that material. A communication from Charles Morey, of Paris, France, esq.

Dated March 14, 1855.

572. Edward Vincent Gardner, of Norfolk-street,

Middlesex Hospital, Middlesex, professor of chemistry. Improvements in furnaces, ash-pits, flues, and fire-places, whereby smoke is prevented, fuel more perfectly consumed, and its heating value greatly economised.

Dated March 26, 1855.

657. Jean Baptiste Dechanet, iron manufacturer, and Antoine Dominique Sisco, practical engineer, both of Paris, France. Improvements in the process of manufacturing metallic tubes and pipes, and in the machines or apparatus used for that purpose.

659. John Gedge, of Wellington-street South, Middlesex. Improvements in the manufacture of gloves. A communication from Felix J. P. Bouvier, of Grenoble, France.

661. John Britten, of Birmingham, Warwick, engineer. A new or improved machine for sweeping or cleaning chimnies.

663. John McKinnell, of Glasgow, Lanark, gentleman. Improvements in ventilation.

665. William Bartlett, of Bradford-street, Birmingham, Warwick, manufacturer. Certain improvements in ventilators.

669. Oliver R. Burnham, of New York, United States of America. Improvements in the construction of projectiles.

671. John Marland, of Leeds. Improvements in preparing for and in sizing and warping woollen and worsted yarn.

673. John Shaw, of Lees, manager, Lewis Harrop, of Oldham, cotton spinner, and James Fielding, of Lees, cotton spinner, all in Lancaster. Improvements in machinery for spinning and doubling cotton and other fibrous materials.

Dated March 27, 1855.

675. John Gedge, of Wellington-street South, Middlesex. Improvements in the mode or modes of transferring designs on to woven, textile, or other fabrics, or on paper, and in the machinery used for such purposes. A communication.

677. Charles Goodyear, of Avenue Gabriel, Champs Elysées, Paris. A new method of moulding India-rubber and gutta percha. A communication.

679. Archibald Turner, of Leicester, India-rubber manufacturer. Improvements in the manufacture of elastic fabrics.

Dated April 11, 1855.

792. Jonathan Edge, of Bolton-le-Moors, Lancaster, engineer. Improvements in steam-engines.

794 Charles Blunt, of Wanstead, Essex, gentleman, and Joseph John William Watson, of Wandsworth, Surrey, doctor of philosophy. Improvements in the composition of artificial fuel, with the machinery employed in the manufacture thereof.

796. John Alderman, of Denmark-street, Middlesex, manufacturer. Improvements in the construction of adjustable couches, chairs, and other similar descriptions of furniture for invalids.

798 Frederick Shand Hemming, of Birkenhead, Chester, engineer. Improvements in the construction of buildings, which improvements are particularly applicable to military and other hospitals.

802. George Fergusson Wilson, Conrad Abben Hanson, and James John Wallis, all of Belmont, Vauxhall. Improvements in the manufacture of lamp candles, and in candle-lamps for holding the same.

804. George Fergusson Wilson and George Payne, of Belmont, Vauxhall. An improvement in ornamenting glass.

Dated April 12, 1855.

810. Ferdinand Wilhelmy, engineer, of Dusseldorf, Prussia. Border paddles for steam-boat wheels.

81?. William Terry, of Francis-street, Aston, Birmingham, Warwick, gun-maker. Improvements appertaining to breech-loading fire-arms.

814. Jules Laleman, of Lille, France, of the firm Canyn and Company. Improved machinery for combing flax and other similar fibrous materials. A communication.

Dated April 13, 1855.

816. James Templeton, of Glasgow, Lanark, manufacturer. Improvements in the manufacture of pile fabrics.

818. Joseph Revell, of Dukinfield, Chester, plasterer. Certain improvements in machinery or apparatus for propelling vessels.

820. John Jarman, of Masborough, York. Improvements in horse-shoes.

822. Thomas Hill, of Walsall, merchant. Improvements in the manufacture of horse-shoe and other nails. A communication.

Dated April 14, 1855.

824. Jules Denoual, of Samares Lodge, St. Clements, Jersey. Certain improved means of enveloping medicinal preparations with soluble substances.

826. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of certain kinds of soap.

828. William Reid, of Holehouse, Neilston, Renfrew, bleacher. Improvements in the treatment, cleansing, starching, and finishing of textile fabrics.

830. Gustave Irénée Sculfort, of Maubeuge, France, manufacturer. An improvement in screw-wrenches.

Dated April 16, 1855.

832. Rowland Mason Ordish, of Copenhagen, Denmark, engineer. Certain improvements in the permanent way of railways.

834. Henry Holmes, of Clifton-road, Maida Vale, Middlesex, doctor of medicine and surgeon. Certain processes of treating the human body by gases, vapours, and electricity, and for certain apparatus for obtaining and applying the said gases, vapours, and electricity, to the above or any other purposes.

836. John Cowley, of Quennington Paper Mills, Gloucestershire, and Daniel Peyton Sullivan, of Stockwell, Surrey. Improvements in the manufacture of paper.

838. William Bull, of Lupus-street, Belgrave-road, Pimlico. Improvements in bearings, bushes, and other surfaces, in or upon which shafts, axles, or other bodies move or revolve, also in the said shafts, axles, and other moving or revolving bodies.

Dated April 17, 1855.

840. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improved machinery for manufacturing nails, bolts, rivets, and other similar articles. A communication.

842. Robert Milligan, of Harden, Bingley, York, manufacturer. An improvement in the manufacture of woven fabrics made of wool, mohair, or alpaca.

844. Charles Crapelet, of Rue des Fossés Montmartre, Paris. Improvements in the construction of tompions for cannon and other fire-arms, which improvements are applicable to stopping bottles and other vessels.

846. Phillip Levy, of Edinburgh, furrier to Her Majesty. An improved wrapper for travelling and personal wear.

848. Cranston Foster, of Warrington, Lancaster, machinist. Certain improvements in effecting communication by signals upon railways, and in the apparatus connected therewith.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

893. Henri Schoofs, of Saint Gilles, near Brussels, Belgium. Improvements in making, fixing, or attaching artificial teeth, gums, and palates. April 21, 1855.

909. Henry Jeremiah Iliffe and James Newman, of Birmingham, Warwick, manufacturers. Improvements in the manufacture of covered buttons. April 23, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 1st, 1855.*)

2680. R. B. Huygens. Improvements in ordnance and fire-arms, and in the projectiles to be used therewith.

2695. Andrew Smith and James Thompson Mackenzie. Improvements in ordnance and small arms by applying thereto projectile force obtained from high pressure steam.

2728. Thomas Boyle. Improvements in reflectors for artificial light.

2735. Margaret Williams. Improvements in suspending swing looking or dressing-glasses.

3. Joseph Seguin. Improvements in obtaining motive power by the expansion of air, steam, and other fluids.

4. George Cram and John Jackson Crane. An improved composition applicable to the coating of ships' bottoms and other useful purposes.

10. Claude Jules Fincken. Preserving, without loss of heat, all windows, glass roofs, false roofs, &c., from the effects of condensation and damp, and also from the effects of external smoke, soot, and dust.

14. Hippolyte Fontaine. Improvements in engravers' presses.

81. Edward Hayes. Improvements in apparatus for feeding thrashing machines.

114. James Lee Norton. Improvements in recovering the wool from fabrics composed of wool, or wool in connection with cotton, or other vegetable substance.

246. Isaac Jecks. A machine for sweeping grass or weeds from lawns or fields, and depositing the same into a box or other receptacle.

261. Thomas Allan. Improvements in obtaining and transmitting motive power.

366. George Tillett. Improvements in the construction of bedsteads.

384. John Hyde Pidcock. An improved method of propelling and steering vessels, which is also applicable to the forcing and directing of liquids and fluids.

396. Walter Neilson. Improvements in locomotive engines.

408. Victor Joseph Lebel, Jean Fourniol, and Jean Baptiste Remyon. Improvements in typographic presses.

496. Perceval Moses Parsons. Certain improvements in fire-arms and projectiles.

570. William Galloway and John Galloway. Certain improvements in balancing or regulating the pressure on the slide valves of steam-engines.

590. Joseph Mitchell. Supplying grease, tallow, or oil, either with or without the addition of black-lead to locomotive engines, horizontal and beam engines, marine engines, and Nasmyth's patent steam hammer.

677. Charles Goodyear. A new method of moulding India-rubber and gutta percha. A communication.

696. Marie Jean Thérèse Gillot and Cécile Célestine Beauvais. Improvements in purifying grain, vegetable or botanical matter, and cochineal.

736. William Lund and William Edward Hipkins. Improvements in the manufacture of cork-screws.

758. Isidore Carlhian and François Isidore Corbière. Improvements in apparatus for making soda-water, and other aerated liquids. A communication from Messrs. Gaillard and Dubois.

760. Joseph Brazier. An improvement or improvements in revolving or repeating fire-arms.

768. Robert William Waithman. Improvements in machinery or apparatus for the manufacture of lint or similar substances.

802. George Fergusson Wilson, Conrad Abben Hanson, and James John Wallis. Improvements in the manufacture of lamp candles and in candle-lamps for holding the same.

804. George Fergusson Wilson and George Payne. An improvement in ornamenting glass.

816. James Templeton. Improvements in the manufacture of pile fabrics.

822. Thomas Hill. Improvements in the manufacture of horse-shoe and other nails. A communication.

828. William Reid. Improvements in the treatment, cleansing, starching, and finishing of textile fabrics.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed April 27, 1855.

2302. Oliver Maggs.
2303. Gustave Hermann Lillie.
2321. James Rae.
2332. Nathaniel Topp, John Holt, and John Partington.
2333. Isidore Alexandre Moineau and Jean Gustave Lemasson.
2354. William Henry Woodhouse.
2670. Auguste François Joseph Favrel.

1855.

313. Edward Sparkhall.
472. William Hunt.

Sealed May 1, 1855.

2338. John Adcock.
2343. Joseph Betteley.
2345. James Wallace, junior.
2352. Edward Hogg.
2393. John Wain.
2495. John Simon Holland.
2646. Edward Strong.
2763. Bernard Hughes.

1855.

361. John Oxley.
381. George Nasmyth.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

J. Simson. — The engine you mention is of 11-horse-power, but it is aided in working the fountain by other apparatus.

Ingénieur.—Believing with you that the discussion on the Indicated Horse-Power of Steam Engines is degenerating into mere verbosity, we decline to publish any continuation of it.

C. R. writes as follows:—"Sir,—I should feel much obliged if some one of your readers could inform me of the best mode of stopping a leaky brick tank without taking out the water. The area of the tank is about 7,000 feet, and the depth 18 feet. I think that a little information upon the subject, stating the plans adopted in specific cases, would be of great service to many of your readers as well as to myself."

W. A. Bendelow.—If you send us a short description of your invention, we will let you know if it resembles the Earl of Aldborough's.

A Journeyman Blacksmith.—Your communication shall be attended to shortly.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne Paris; Mason and Co., *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1657.] SATURDAY, MAY 12, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

GRAY'S PATENT COMPASSES.

Fig. 1.

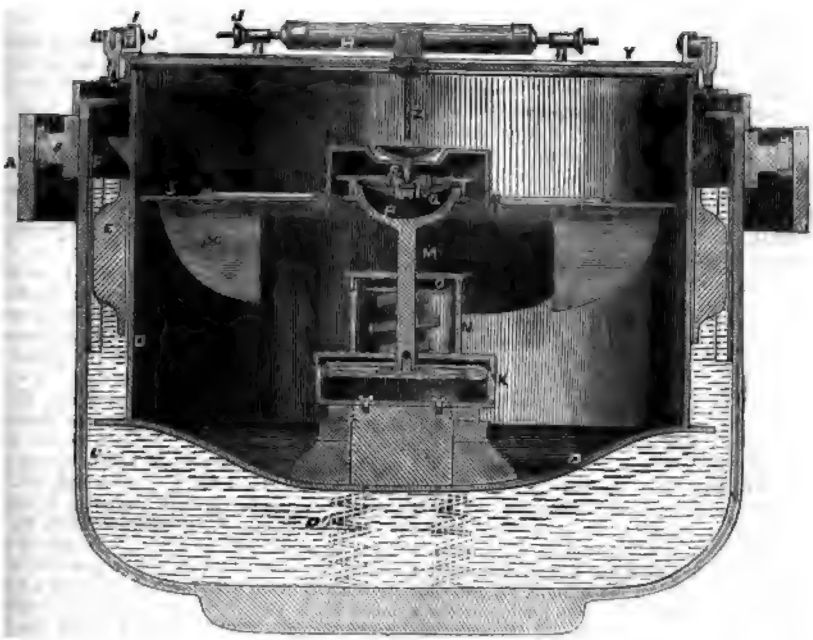
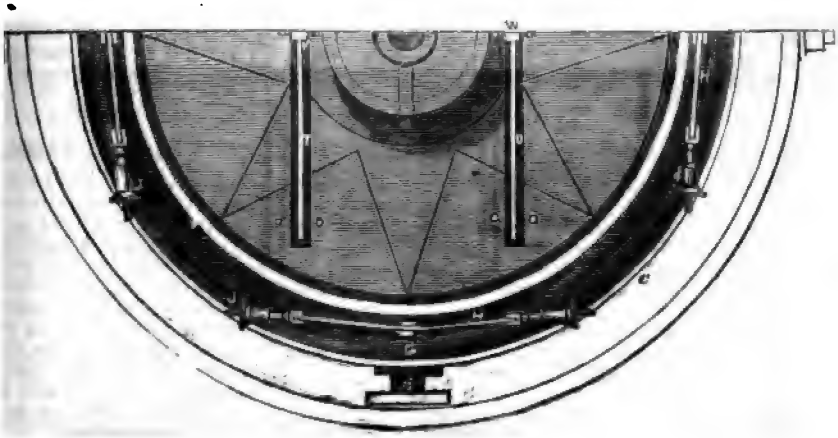


Fig. 2.



GRAY'S PATENT COMPASSES.

(Patent dated August 28, 1854.)

MR. J. GRAY, of Liverpool, has recently invented a compass, of which he himself entertains a very high opinion; for in a lecture delivered by him, on the 15th of January last, at the Liverpool Polytechnic Institute, after enumerating the various causes of deviation which affect the compasses of ships, he says, "But I hope to see the day when the incubus of public hypothesis will no longer exist, and that the apparatus I have invented will be the pioneer to its accomplishment. With this apparatus, all that is required is an observation by night or day, either by the pole star or meridian altitude in the northern region, or the southern cross and altitude in the southern; two positions are merely required, and the adjustment for heeling can be effected when under a press of canvass."

"The invention consists," says Mr. Gray, "in so arranging and constructing ships' compasses as to counteract the vibratory action to which they are subject in steam ships and other vessels. The compass is suspended within a vessel or bowl, which is held in a state of suspension within another vessel or bowl containing fluid, which I prefer to be of thick varnish, on account of its adhesive and sluggish action, which is beneficial in keeping the inner bowl steady; and I connect the bottom of the inner vessel or bowl with the bottom of the outer vessel or bowl by springs; and I also connect the upper and inner rim with the outer rim by vulcanized India-rubber or other springs, the inner vessel or bowl being kept in a central position by tangential screws, so as to counteract the lateral action, whilst the springs below will regulate the vertical position of the inner bowl in conjunction with the fluid contained in the outer bowl."

Fig. 1 is a section, and fig. 2 a half-plan, of a compass arranged according to this invention. A is the outer ring of the gimble, on which are bearings for the axes, B, fixed on the vessel, C, which contains a fluid, such as a saturated solution of common salt; or it may be varnish or other fluid, which is rather sluggish in its movements. In this vessel, C, floats the vessel, D, in which the needle and card are contained. E E are two pieces of metal attached to the vessel, D, which slide in guides, F, attached to the vessel, C. To the vessel, D, are also attached four lugs, G, which nip vulcanised India-rubber springs, H, to the ends of which are fastened metal screws, having square shanks, which pass through holes of a similar form in the uprights, I, attached to the vessel, C. The screws are furnished with nuts, J, by means of which the tension of the springs may be adjusted, and the vessel, D, held concentrically with the vessel, C, and this is assisted by the springs, D^1.

The needle and card are supported as follows, the object being still further to decrease vibration. K is a metal box, in which is contained a vulcanized India-rubber disc, L, on which the foot of the spindle, M, presses. The spindle slides freely through the top of the box, K, and also of the box, N, above it; within the box, N, is a spiral spring, which acts on the disc, O, on the spindle, M, and thus prevents it from pressing too strongly on the India-rubber disc, L. On the top of the spindle, M, is another box, P, in which also is a vulcanized India-rubber disc, Q, in the centre of which the cup, R (which receives the pin of the compass card), is fixed. Round the cup, R, is stretched a ring of vulcanized India-rubber, to prevent it from jarring against the cover of the box, P. S is the compass card, on which, by preference, two needles, T and U, are mounted on centres at V and W; X are plates of talc or other material, which, by offering a resistance to the air, check the oscillations of the compass; Y is a glass which covers the vessel, D; and Z is a pin, descending from the glass, Y, to prevent the card being thrown out of its bearing by a sudden shock.

ON THE DISTRIBUTION OF MATERIAL IN WROUGHT-IRON BEAMS.

AT the Institution of Civil Engineers, on Tuesday evening, May 1, the discussion was renewed on Mr. Barton's paper "On the Economic Distribution of Material in the Sides or Vertical Portion of Wrought-Iron Beams," and was continued through the evening.

Allusion was made to a paper recently read before the Royal Society by Mr. W. H. Barlow, wherein it was shown that under the existing theory of beams, in which only *two elements* of resistance — tension and *compression*—were recognised, the strength of a beam of cast-iron could not be reconciled with the results of experiments on the direct tensile strength, if the neutral axis was in the centre of the beam. A series of experiments had been made, with the view of determining the position of the neutral axis, and the results showed that the extensions and compressions proceeded in an arithmetical ratio, from the centre to the upper and the lower sides of the beam; and that at any given distance on either side of the centre, the amount of extension was equal to the amount of compression.

The position of the neutral axis being thus ascertained to be in the centre, it was shown, that not only the ultimate strength, but also the amount of extension and compression with a given strain, indicated the existence of another element of resistance, in addition to the resistances to extension and compression. Further consideration of these results, and investigation of the action of the fibres under different degrees of extension and compression, induced the conviction that the effect of the lateral action, tending to modify the effect of the unequal and opposite strains in a beam, constituted, in effect, a "resistance to flexure" acting in addition to the resistances of tension and compression.

A long investigation, and a great number of experiments induced the following conclusions:—That when the top flange was not of a less section than one-seventh that of the whole beam, the middle rib affected the strength to the extent of one-half the value of its material, as if placed on the bottom flange; that when a beam was loaded on one side of the bottom flange only, it became necessary to increase the section of the top flange to about one-third of the whole section of the beam; and, that when these proportions were attended to, the following rule would be found correct:

Area of bottom flange.
+ Half the area of the middle rib.
× Depth between the centres of the top and bottom flanges.
× Constant number 28.
÷ Length of bearing (all in inches).
= Breaking weight on the centre, in tons.

This rule gave 54 tons for the beams above mentioned, and it would be found to apply, with equal correctness, to any other proportion of beam, provided the top flange was large enough.

The investigation alluded to extended to the examination of every form of beam, and the construction of simple furmulæ for them, and the details were promised to the Institution on a future occasion.

It was submitted that in the case of the vertical rib of a beam being thick enough not to require strengthening by angle iron, or other bracing, the whole strain was horizontal, and no diagonal strain existed; but when angle iron pillars were used, and the thickness of the rib was diminished, the normal state was altered, and diagonal strains were induced. The angle irons then had to keep the top and bottom asunder, and performed the functions of columns under compression.

Admitting then the existence of diagonal strains, and with the view of throwing the top into compression and the bottom into extension, for which the upright angle iron columns were not intended, and trying the effect of forces at different angles, keeping in view also the requisite material in the cross section, and the length of each, the angle of 45° appeared to be most advantageous, both for the ties and the struts of "Warren" girders, and the intersection of the bars of trellis beams.

It was due to the designer of the Boyne bridge to state, that a greater amount of deflection might have been anticipated, from the yielding of the numerous component parts of the trellis beams, as compared with the more homogeneous construction of plate beams.

The greatest advantage of the plate beam over the "Warren" girder and the trellis beam, consisted in the perfect uniformity with which the strain was brought upon the top and bottom, throughout the entire length.

It was contended, that before instituting a comparison between the relative merits of plate, or trellis sides for a girder, it was essential to obtain something like a clear notion of the nature of the strains developed in a plate, when placed between two systems of particles constituting the upper and the lower webs of a girder. It was necessary also to direct attention to the usual mode of arriving at the position of what was termed the neutral axis of a beam.

The forces supposed to be called into play were invariably assumed to be in horizontal lines; consequently, in a series of lines represented by two triangles, those of the triangle near the upper web of the beam were assumed to be in a state, more or less, of compression, and those of the other triangle in a state of tension. The point of meeting of the apices of the two triangles was therefore supposed to be neither in a state of extension nor of compression. This portion of the material had, consequently, been generally assumed to be in a quiescent state, and as adding nothing to the strength of the beam. If the forces developed were really horizontal, this conclusion would, no doubt, be correct; but inasmuch as, whatever might be the deflection of a beam, any one particle of matter in the top could only maintain its relative position or distance in reference to any one particle in the bottom, it was obvious that in respect of all others every intermediate particle must be subject, as the case might be, to extension or compression; and therefore proceeding from one end of the beam to the other, and tracing the connection between the top and bottom particles, it inevitably followed that no one particle could escape being exposed to an infinite variety of strains, comprising every degree of intensity between

extreme compression and extreme tension. Hence it was apparent that, by no possibility, could a line of particles be traced in the vertical rib which was not subject to strain, and therefore, although there might be traced a line or lines about which the forces on either side might balance each other, yet nevertheless the particles themselves in these lines must be subject to the conflicting strains before adverted to. This view might be illustrated by assuming a neutral axis to exist in any vertical section of a girder; and if the ordinary presumption were true—that the material in the vicinity of the so-called neutral axis were useless, or might be removed without impairing the strength of the beam—it was evident that, by the same reasoning, a line of particles might be removed from the vertical rib, throughout its entire length, without inflicting on it any injury. This was, however, so manifestly inconsistent with fact as not to be tenable. In short, it would appear, therefore, that throughout the whole area of the vertical rib of a plate beam, every particle was exposed to an infinite variety of strains, both of compression and extension, at angles to each other; or, in other words, every particle was performing a double amount of duty. This view appeared to enable a comparison to be established between the nature of the strains existing respectively in trellis girders and in plate beams In the trellis girders, one system of lines was devoted exclusively to bearing compression, whilst the other system was entirely devoted to resisting extension. If the trellis lines were, therefore, increased in number until they formed a continuous plate, it was clear that the vertical rib would be divided into two portions—one solely resisting compression, and the other extension. Now, since the power of a plate to resist extension could hardly be affected by being exposed at the same time to compression at right angles in the line of tension, it would seem reasonable to conclude that a larger amount of material was required, when arranged as a trellis, than when disposed in the form of a plate. This view might be further illustrated by referring to a piece of open trellis-work, where it was evident that, at each intersection of the bars, double the amount of material was required, one half of the thickness being under compression, and the other half at right angles being under tension. This view was not urged with the object of disparaging the system of trellis structures, but rather as exemplifying the position previously assumed in favour of the system of plate structures.

These views were brought forward, to some extent, without that premeditation required by so intricate a subject, and chiefly with the object of directing the attention of the profession to the question, as it appeared evident that beam bridges were about to supersede all other systems of construction. It was, therefore, extremely desirable to subject all the systems to the same rigid scrutiny as the trellis and the truss had undergone, in the hands of Mr. Doyne, whose valuable paper, presented in conjunction with Professor Blood in 1851, left little or nothing more to be written on the subject, and the accuracy of the experiments there given had been satisfactorily tested subsequently to the reading of the paper.

In reply to the objections urged against the positions assumed in the paper, it was contended that the allegation of the strains in a plate beam being altogether horizontal, could not be maintained, inasmuch as it was opposed to the simple mathematical proposition, that a vertical weight could not be held in equilibrium, by strains which were only horizontal; that it was, therefore, absolutely necessary for a diagonal or oblique strain to exist, in order to effect the resolution of a vertical force into a horizontal direction. If this was conceded, and also that the compressive strains in a plate beam were carried (as in all plate beams yet constructed they were actually carried) by vertical pillars, the oblique resultant must be sought for in the tensile strains passing through the plate sides, and thus the plate would be doing the diagonal tensile work in the beam; but it had been contended that the plate was taking both horizontal and diagonal strain, and that the plate did perform the double duty, which the trellis system could not perform. The simple reply to this was, that the first authorities on plate beams, and who had given such interesting information on the subject, had never proposed to obtain any definite advantage from the horizontal strains in the sides; that in fact they were not, in practice, calculated on as thus affording strength, and that, therefore, practically they were not of any value, inasmuch as they did not save any material, nor would it be safe to adopt any other practice with the present amount of knowledge of the actual lines of the strains in plate beams; and this was confirmed by a closer examination of the subject, for if it was conceived that a portion of plate was acted upon by both diagonal and horizontal strains, it could not be considered as capable of bearing in both directions as much as it would in one, and that so far as the iron was acting for horizontal strain, whilst at the same time the portion acting horizontally was acting at a disadvantage, from not being at the bottom or the top of the beam. This last point was put forward as a probable, but not an absolute determination of the effect of these

crossing strains, but it was sufficient to render the advantage of a continuous rib very doubtful as regarded horizontal strains.

The iron lost at the intersection of the lattices had been looked upon as a matter which increased as the lattices approached each other, and might, if the lattices were very close, cause a loss of about 50 per cent.; but it was submitted that the author of the paper did not contemplate greater loss in this way than in the Boyne Viaduct, in which the amount really lost in the sides, from that cause, was rather under 1 per cent.

It had been said that the angle of economy for bracing was not determinate, and where plate beams were concerned, this was admitted to be indeterminate, so far as the present knowledge extended; and in this consisted one great advantage of the trellis beam, inasmuch as both the angle of economic bracing, as well as the amount of strain in the trellis, could be investigated with mathematical correctness. The statements in the paper respecting a saving of 33 per cent. in the sides, were not in any way modified or withdrawn; and the angle of 45°, which was assumed for the investigation of the plate beam, had been so assumed because it was the angle which gave the plate beam most advantage, and it was contended that the saving in practice was over that per centage.

It was contended that the tubular beams, now being constructed for the "Victoria" Bridge, over the St. Lawrence, which had been adduced as examples of excellent proportions of material, might be used for demonstrating the saving which would have been effected by the adoption of trellis sides. This portion of the subject would be reserved for treating at the resumed discussion.

The paper had been listened to with great patience; the views it propounded had been received with much kindness, and it had, at least, the merit of having induced some of those who justly stood at the head of the profession to come forward and give to the Institution their thoughts and views on an important subject, in a very instructive manner.

IMPORTANT IMPROVEMENT IN THE ELECTRIC TELEGRAPH.

A discovery is said to have been recently made at Stockholm, which, if it can be realized and practically applied, will tend greatly to facilitate telegraphic communications. The discovery to which we allude is the means of transmitting two messages at the same time along a single wire.

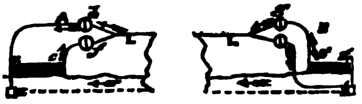
It is evident that if at the same instant a message is sent along a wire in one direction, another message could be speeding its way through the same wire in the opposite course, one-half the number of wires would be sufficient, and there would consequently be a great saving in the cost of forming new telegraph lines, and that those already laid down would be enabled to transact double the amount of business they are now capable of doing. To those who are not acquainted with the modes of transmitting electric telegraph signals, it may appear at first sight impossible to send messages in opposite directions at the same time along a single wire, as one current of electricity, it might be supposed, must necessarily clash with and counteract the transmission of another current in the opposite direction. But, in point of fact, not two only, but hundreds of electric currents in differing directions are frequently passing through the same medium, without the slightest interference. The difficulty to be overcome is altogether of a practical kind, and that it does not arise from any limited capacity in the wire may be shown by actual practice in existing telegraphs.

In the early days of the electric telegraph, before the conducting power of the earth was well known, a single wire only was employed for the return current, though several were required to transmit messages, and through that single wire different currents were often passing at the same instant. When the conducting power of the earth was applied to complete one-half the circuit, the moist ground became the transmitter of currents from every electric telegraph that was established, and through that medium there are now passing messages of all kinds, which, though mingled together in mother earth, become separated at the poles of their respective voltaic batteries, and are delivered without any interference with one another. Thus in constructing a telegraphic line, a wire insulated from connection with the ground, by being supported on posts, is extended between the towns to be placed in communication, and at each end the wire is connected with a copper plate buried in the earth, to complete the voltaic circuit. These plates of copper, technically called "earth plates," or more commonly "earths," conduct the electricity from one to the other through the moisture of the earth much more readily than any artificial metallic conductors that could be laid down; the resistance thus offered to the transmission of electricity being so small as to be scarcely appreciable. These earth connections are so convenient that they have been formed at all the stations where telegraphs have been established, which are thus voltaically

connected together. Suppose, for instance, that the zinc end of a voltaic battery is connected with the earth, and that the copper end is connected with a needle instrument in London, and that that is connected with the telegraph wire supported on posts and extended to Edinburgh, where, after passing through a corresponding instrument, it is connected with a metal plate buried in the ground. The electric current will then pass through the instrument in London, along the wire to Edinburgh, where it will deflect the needle, and passing on to "earth," will there come into instantaneous connection with the zinc end of the battery from which the current emanated, and will return to that battery regardless of all interposing electric currents that may be passing through the earth at the same time. A slight knowledge of the nature of a voltaic battery will be sufficient to prove that it could not be otherwise. No excitement of voltaic electricity can take place unless there be a connection between the two poles of the battery. So long, therefore, as the wire at Edinburgh continues detached from the earth plate, the battery in London remains inactive, provided the wire be perfectly insulated. It is by the act of bringing the two poles into connection by means of the wire and earth plate at Edinburgh, that the electricity is excited, and the current is sent in that direction alone. The action of all other batteries that may be connected with the earth cannot affect the electric current thus established between London and Edinburgh, because they do not contribute in any way to complete the circuit by which alone the electricity is at once excited and transmitted. A metallic conductor, in the same manner, will connect the opposite poles of any number of batteries, and will thus serve to transmit several differing electric currents without their interfering. It would not be difficult, indeed, to make a single wire form part of the circuits of one hundred different batteries, each one of which might be transmitting distinct telegraphic messages.

From this consideration of the facility with which a single wire can conduct different electric currents, it might be supposed that there would be no difficulty in completing such an arrangement as is now said to have been effected in Sweden, and that one wire might be made to serve the purpose of the thirteen that are supported on posts near London, in addition to others that are buried underground. It is, nevertheless, one of those things which, though often attempted, has not yet been practically accomplished; nor do the accounts of the *discovery* by Professor E. Edlund, of Stockholm, represent him to have done more than send two currents along the same wire, and those in opposite directions. The great difficulty to be overcome in endeavouring to effect such an arrangement is, to prevent the electric current from the transmitting battery from making a short circuit through the adjoining instrument, instead of traversing the wire to the corresponding instrument at the distant station. The accompanying diagram will serve to show the direction which the electric current would take, if there were no special provision to break contact with the near instrument.

Fig. 1.

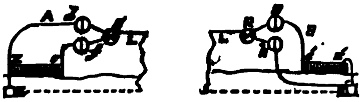


Let *d*, *f* represent two telegraph instruments at the station, A, the upper one of which, *d*, is intended to receive messages transmitted from the instrument, *g*, at the station, B; and the lower one, *f*, is the instrument connected with the voltaic battery, *c z*, from which messages are to be transmitted to *h*, along the line-wire, L, to the earth plate, E′, and through the earth, back to the battery. It will be perceived, however, that as the instrument, *d*, is also connected with the line-wire, and with the earth plate, E, that a short passage is open for the transmission of electricity from *c* to *z*, in the direction of the arrows, without traversing the line-wire, consequently there would be no electric current sent to the instrument, *h*. The same effect would attend the arrangement at B, where a short circuit would be also established through the second instrument, and no communication could be made between the distant stations. If, again, it were attempted to send several messages along a single wire in the same direction, by having separate batteries and instruments, the electric currents might be transmitted to the distant instruments, but they would pass through all of them indiscriminately, producing an incomprehensible medley of signals. The problem, then, to be solved is, to make an arrangement by means of which the electric current from the battery at A may be sent along the line-wire, without being diverted through the instrument, *d*, and yet at the same time to maintain such a connection between the instrument, *d*, and the line-wire and the earth, that it may be always in a state to indicate the signals that may be transmitted to it from the corresponding station.

No description has yet been received of the mode by which Professor Edlund pro-

poses to overcome the difficulty, but we can fully understand the principle on which such an arrangement may be made, and we may venture to point out the means by which it might be successfully accomplished. Supposing the arrangement of the instruments and batteries to be the same as in the preceding diagram, let there be introduced at the points of junction with the line-wire, small instruments for making and breaking contact, R and S, fig. 2.

Fig. 2.



The cross lines in the contact wheels represent strips of metal inlaid in wood, and when in the position shown in the diagram, the instrument, *h*, would be connected with one end of the line-wire, and the instrument, *f*, would be connected with the other end, whilst the two instruments, *d* and *g*, would be out of contact. Under these circumstances an electric current would pass from the battery at the station, A, through *f*, to the instrument, *h*, whence it would be transmitted to the earth, and by thus completing the circuit those two instruments might communicate with each other as perfectly as if there were no other instruments connected with the wire. If the wheels, R and S, make the eighth part of a revolution, the positions of the wires forming connection with the instruments would be reversed, and then *f* and *h* would be thrown out of contact, and the current would be transmitted from the voltaic battery at B, through *g* and *d*, and those two instruments would be able to communicate. It is evident, if the two contact-wheels could be made to rotate exactly together, that independent signals might be transmitted through at least two instruments at the same station at the same time, through a single wire. The synchronous movement of two instruments at distant stations has been accomplished in Mr. Bakewell's copying telegraph; therefore, it is quite possible to effect such an arrangement as the one we have indicated.

But it may be said that this would not solve the problem, because not more than one electric current would be transmitted along the wire at the same instant. The currents would, indeed, be transmitted alternately, but, for practical purposes, the effect would be the same as if they were passing at the same instant, for the alternations might be made so quickly as to appear to be continuous, and to answer the same purpose as if they were. Suppose, for example, the wheels, R and S, to be rotating ten times in a second, then, as contact would be made and broken four times each revolution, the corresponding instruments might be placed in connection with each other forty times in a second. The greatest number of beats by the needle telegraph during the rapid transmission of a message does not exceed five per second; therefore, with a much smaller number of alternations than we have supposed, each instrument might be simultaneously sending and receiving messages along the same wire: nor need the number be limited to two instruments and two different stations. It might be possible to arrange on the same principle many instruments connected with others at several stations, and thus all the telegraph communications of an extended line might be maintained with one or two wires, and each station might have a separate means of communication independent of the other stations beyond it, with which it would not interfere, and from which it would be just as distinct as if separate wires were laid down to each station. For the purpose of sending messages in opposite directions by the same wire between only two communicating stations, it would not, indeed, be necessary that the contact-wheels should rotate synchronously. If one of them was rotating rather faster than the other, the number of times that connection would be made and broken with the corresponding instruments during a second would be so great, compared with the number of signals transmitted, that the electric current would not be perceptibly interrupted during the transmission of a message. It would, indeed, be far better that a synchronous movement of the wheels should be arranged, which we believe might be effected at any number of stations along an extended line of communication by means of an additional wire; for then not only could messages be sent and received at two stations at the same time by one transmitting wire, but several instruments at all the stations might be receiving and transmitting messages with that same wire. By this means two wires might serve the purpose of many, and as those only would be required they might be made thicker, and be more carefully insulated, than is economically practicable when many are wanted for doing the same amount of business; and thus telegraphic communications might be rendered more free from the interruptions caused by imperfect insulation and by accidents to the wires, as well as much cheaper.

Whether the arrangement we have suggested be similar to that which is said to have been successfully made by Professor

Edlund, we have no present means of know ing. We wish to show that such a plan is practicable, and that it might even be extended far beyond the limits to which the accounts yet published state that it has been carried.—*Civil Engineer and Architect's Journal.*

AN IMPROVED TUYERE FOR SMITHS' HEARTHS.

THE subject of a paper read at a recent meeting of the Institution of Mechanical Engineers, Birmingham, was an improvement upon the ordinary water-tuyere or tue-iron for smiths' hearths, which has been found advantageous in much increasing the durability of the tuyere.

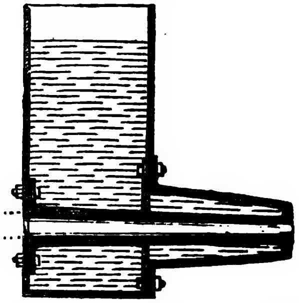
The improved tuyere has been in use for some years by the author, at Messrs. Brown, Marshall, and Co.'s Works, in Birmingh am with very satisfactory results, and also at some other works; several modifications having been made of the same principle of construction by the different parties who have adopted it.

The original suggestion was made by Mr. John Lee, then of the Britannia Foundry, Derby, who about eight years ago had his attention called to the defects of the ordinary water-tuyere, when making trial of a number of cast-iron ones as cheaper substitutes for the wrought-iron tuyeres, in some large fires for wheel-making belonging to the late Mr. Frost, of Derby. They were made in the usual way, with a water cistern above, connected by gas piping, and great difficulty was experienced in keeping them at work, the ends of the tuyeres being sometimes burnt out in a single day's work.

It then occurred to Mr. Lee, that the intense heat acting on so small a quantity of water, caused steam to be formed at the end of the tuyere, which forced the water back into the cistern, and prevented a further supply through the very small pipes; the general opinion amongst the workmen was that the supply-pipe was stopped up with dirt, but on examining several, that was found not to be the case. Mr. Lee then proposed the construction shown in fig. 1; to have a large body of water always in connection with the tuyere, by opening the entire end direct into the water-cistern, so as to insure in all cases a good supply of water, and prevent the heating of the water at the end of the tuyere to so high a temperature as to generate steam.

The first one made on this principle was put to work in 1846, and proved quite successful; it was a single casting, and similar to fig. 1; the inner pipe being carried straight through to the back of the water-cistern, for the blast to enter.

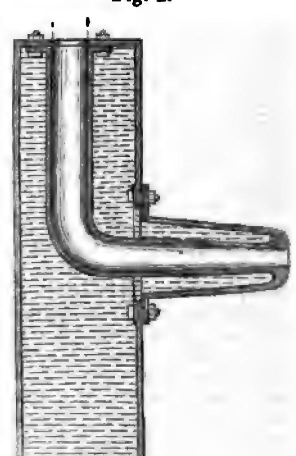
Fig. 1.



Several more were shortly afterwards made upon the same plan, and some with the inner pipe turned at right angles, as in fig. 2, which is a plan, and passing out at the side of the cistern, where there was not convenient space at the back for the branch air-pipe and cock. The pipe has also been turned upwards, in some cases, where required for hand-blowing, with the bellows fixed aloft.

In these tuyeres, the outer portion alone being exposed to the fire, the inner pipe has no wear upon it, and the outer portion only requires renewal. A modification of the construction was suggested by the author's brother, Mr. George Ross, to provide for this by making the two portions separate, and fitting them together at the nozzle by a turned coned joint. The outer portion was thus a short casting bolted on by a flange,

Fig. 2.



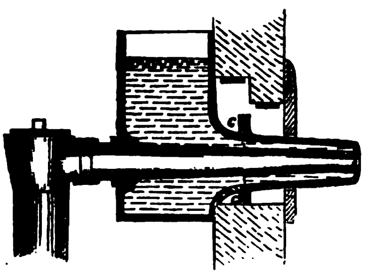
easily removed and replaced at a small cost whenever worn out. The back end of the

inner pipe was passed through a socket in the back of the cistern, packed with hemp tightened by a flange with bolts, so as to give a little play for the unequal expansion.

There are thirty-five tuyeres on this last construction in use at the Britannia Carriage and Wagon Works, near Birmingham, most of which have been four or five months at work, and they have proved so satisfactory that thirty-five more fires have been fitted with them; the cone joint at the nozzle has remained quite tight, the only failure being that a few of the outer pieces have cracked at the end from the cone joint. This construction is preferred to the single casting, as less expensive in repair, and avoiding the imperfection in coring out the water space at the nozzle, to which the single casting is liable.

The wrought-iron tuyere shown in fig. 3 is, however, considered preferable, though more expensive at first, as it is more durable than the cast-iron one, being not liable

Fig. 3.



to crack, and rather thinner in the metal; the nozzle is formed by a narrow ring welded solid, and the back end is fixed in the plates of the cistern by a ring of wood driven into the socket in segments, forming a simple and very durable joint.

The end of the inner pipe is made a few inches longer than necessary, to allow of cutting off the nozzle, whenever burnt out, and shortening the tuyere by welding on another ring to form the nozzle.

The author has had seven of these wrought-iron tuyeres in constant use, one for eleven months, and the rest for an average of six months, without any perceptible wear.

After the reading of the paper, the Chairman, Mr. W. Fairbairn, inquired where the improved tuyeres were at work, and to what extent they had been adopted?

Mr. Ross replied, that there were many of them in use in Derby, and a number at his own works, and some other works in Birmingham; but he was not aware whether they had got into use elsewhere to any extent at present. He had expected Mr. Lee to be present at the meeting, who would have been able to give more information about their use. Mr. Lee had used the first of these tuyeres about eight years ago, but those at his own works had been only two or three years in use. These were all cast-iron, but made so as to admit of adopting the proposed wrought-iron nozzles afterwards in the course of repair, as he considered wrought-iron so much better for the purpose as to be worth the extra cost. All those that he had used had continued at work satisfactorily, without giving any trouble; except a few of the first which had the tuyere placed below the bottom of the cistern, attached to the underside, and were found to get choked up in time by the sediment depositing in the water space of the tuyere; all the others, which were attached at the side of the cistern above the bottom, remained entirely free from obstruction.

Mr. Beyer had seen a similar construction of tuyere before, and considered it a good plan, and he had adopted it at his own works recently, as preferable to the ordinary water tuyeres; he thought it was as much as twelve years since it was first introduced.

Mr. Jones remembered also a similar tuyere in use earlier than that time.

The Chairman remarked that the mechanical value of the invention was the more important question for consideration, rather than that of priority of invention.

Mr. Fernie said, that as successor to Mr. Lee, at the Britannia Foundry, Derby, he could speak to the wear and efficiency of the improved tuyeres, and he had found them very durable and satisfactory in work. He had a considerable number in constant use, and none of them had required replacing during the last two years; they continued quite sound and in good order, although all of them were cast of the simplest form, as in the first engraving shown, fig. 1. He had not found any disadvantage from making them of cast-iron, and it was an important point in such things to obtain cheapness and simplicity of construction; any adoption of wrought-iron for the purpose would add materially to the cost, and he did not think, from his own experience, that it was required.

The Chairman thought the tuyere appeared a decidedly useful improvement, and it was one of those cases of simple inventions that were often very useful and serviceable to be brought before the members. He proposed a vote of thanks to Mr. Ross, which was passed.

PADDLE *versus* SCREW.

An experiment of an interesting nature, and attended with important results in connection with steam navigation, has recently

been made by the Peninsular and Oriental Steam Company, who, more fully to test the respective merits of the paddle and screw, have altered one of their fine steamers from a paddle-wheel to a screw. The steamer in question is the *Sultan*, an iron ship of 1,200 tons burden, originally fitted with engines of 420 horse power. The alterations now made in the vessel have caused the old machinery to be entirely discarded and in its place engines of only 210 horse power have been supplied by Messrs. Sunmers and Day, of Southampton, with Lamb and Sunmers' patent flue-boilers. An opportunity was here afforded of exhibiting the difference in speed caused by the alteration not only in the method of propulsion, but in the power of the machinery. The experiment has not only been successful, but the result is sufficiently extraordinary to merit the attention of scientific men. At the official trial trip of the *Sultan* in 1851 with paddle-wheel engines of 420 horse power, the average speed was 10·714 knots an hour. With the new engines, which are precisely half the power of the old ones, but driving a screw, the average speed under steam alone has been 10·47 knots; and with a light breeze, and the fore and aft canvas set, 11·004 knots, the former being very nearly equal to the speed gained when the ship was driven through the water by paddle-wheel engines of such enormously disproportionate force. The slight and almost insignificant difference in speed is not the only advantage gained by the novel change. In place of carrying only eight days' coal as heretofore, the *Sultan* can now stow fuel for 16 days' consumption, has greater accommodation for passengers, and can take 150 to 200 tons more cargo than it was possible to carry before. With this combination of advantages, added to the fact that the wear and tear and working expenses of the ship are proportionately reduced, it is no marvel that the experiment has been regarded with much interest, as being one never before attempted. The trial trip to-day was attended by many gentlemen connected with steam navigation, several of the directors of the company, including Mr. J. Allan, the managing director, Admiral Thornton, Admiral Sir Richard Grant, Captain Nairne, R.N., Messrs. De Salis and Hadow, Captain Engledue, Mr. A. Lamb, Mr. Dinnen, the Government surveyor, &c. The *Sultan* is heavily rigged, and can spread a great deal of canvas, so as, when necessary, to be entirely independent of steam power. The tests applied to-day have proved the excellence of the machinery, and the admirable *handiness* of the ship, whether regarded as a *full power* steamer or as a vessel embracing the advantages both of a sailing vessel and auxiliary screw. She is to be placed at once on the Southampton, Malta, and Alexandria station.

Southampton, Wednesday, May 2.

Times.

BIDEN'S PATENT IMPROVEMENTS IN MARINE STEAM ENGINES.

The increased extent to which high-pressure steam is now coming into use, renders it necessary that all accessory contrivances for improving the effectiveness and economy of engines should be made available. At present there is excessive waste in our modes of condensation, and boilers are rapidly destroyed by the injurious action of salt water upon them.

It is well known, and has been frequently shown by experiment, that steam is readily condensed by being passed through a metallic conduit immersed in a constant stream of cold water. Symington and others availed themselves of this mode of condensation. Mr. Biden contemplates in his patent the adaptation of this system to high-pressure engines, so as to return the condensed steam, as water, at nearly boiling temperature, into a reservoir whence it is to be pumped back into the boiler. The temperature of this returned water may, of course, be regulated by the length and size of the pipe or conduit through which it is passed, these being determined also by the pressure at which the steam leaves the cylinders.

The great advantages resulting from this arrangement are easily seen. The duration of the boilers employed in connection with it would be much increased, and the expenditure of fuel would be necessarily diminished.

The patentee provides two safety or escape-valves; one to carry the steam which passes off when the engine is stopped to the condenser—the other, which is a little more weighted, to ensure safety should the first, by neglect or accident, get out of order.

Elementary Physics; an Introduction to the Study of Natural Philosophy. By Robert Hunt, F.R.S., Author of "the Poetry of Science," "Researches on Light," &c. New edition with corrections. London: H. G. Bohn, 1855.

The proper object of social institutions is the education of the people—of the nation. Our government and our laws should have this for their end more or less directly. Education in its broadest sense is the great purpose to which all human action should be devoted. To raise and ennoble the mind,

the soul of the nation should be the aim the final cause, of a national constitution and government. This is in fact necessary to national stability; for, though in times of peace and prosperity things may go smoothly enough even with the ignorant and debased, when the "evil day cometh," such a strength and health, both mental and corporal, is needed to support its trials as only thorough education can ensure. However little our *legislature* has hitherto regarded this, our Societies of Arts, our Mechanics' Institutions, our Working Mens' Colleges, are the expression of a very general desire to extend facilities for acquiring knowledge to those who are unable to attain it by means, which though more effectual, require more time and wealth than they have at their command. The most powerful engine of general education is, of course, formed by our literature and our press—an engine capable of affording to the opulent a means of self-improvement and culture always at hand, and of rendering the amusements and recreations of the labourer and the artisan instruments of self-instruction. Thus large benefits have accrued, and are looked for, from our healthy, widely spread, and cheap literature. To provide these hoped-for results literature must, without doubt, be devoted to the dissemination of truth—moral, scientific, and other. And notwithstanding that vicious publications may have tendencies to produce effects exactly opposite to those resulting from books of worth, there are two principles which insure us against the evils of such instances. First, works of evil tendency must, from the nature of the case, be less numerous and of less frequent occurrence than those of good. Second, evil books will, in the main, be less readily received than good. The general truth of these must be admitted by all who advocate the freedom of the press, as such advocacy can hardly have any other firm foundation.

Few things can, perhaps, do more to raise and expand the general mind than a knowledge of the laws which are observed to be fulfilled in the operations of nature around us, and any one who should increase the facilities for acquiring such knowledge would confer a considerable benefit upon society. Any one who writes a work setting forth more clearly and correctly these laws, so that they can be thus brought within the reach of a larger number than hitherto, deserves our thanks. On the other hand, he who, assuming to himself the office of public instructor, though without a single qualification, puts forth a work pretending to give accurate and complete knowledge, while it contains more falsehood than truth, leading those of its readers who will be led by it into error—such a one deserves to be regarded as a man desirous of stealing into the temple of fame unlawfully — one who wishes to be esteemed a man of learning and a philosopher, without ever having given to the subject he treats, that labour and attention which alone can furnish a claim to such titles. Not a little harm is in the power of such a one to do. For it is no easy matter to protect those who desire to obtain elementary books to instruct themselves in matters of science, from the adulterated wares of the scientific pretender and charlatan. Those who read such books, will at best find that much valuable time has been wasted in reaching the conclusion that they are entirely unworthy of confidence; and perhaps be discouraged from pursuing their purpose. All this is worse when the author comes forward with the prestige which the letters F.R.S. afford as appendages to his name.

It is in this very painful light that Mr. Hunt appears to us in this book on elementary physics. In his preface he tells us that "intimate association with those institutions which are devoted to the diffusion of useful knowledge has led to a conviction that, notwithstanding the increasing desire manifested amongst their members to cultivate an acquaintance with physical science, the means has not been afforded by which this important study might be facilitated." He wrote his book "impressed with the idea that it is quite possible to render every truth intelligible by the most simple language—that it is practicable to teach physical science, so far as to render all the great deductions from observation and experiment satisfactorily clear without encountering the difficulty of mathematics." Its "design is, to give accurate information on every important fact connected with physics; to explain the experimental evidence by which each law has been developed; and by avoiding mathematical details,—while accepting the proofs they afford,—to place clearly the deductions from physical investigation before those to whom the higher-class treatises are sealed books."

This is certainly a great deal by way of promise and pretension. The book itself, written to justify this pretension and fulfil this promise, contains hardly a single statement which, if it can be shown to mean anything, cannot be shown to be false. Reading it serves one purpose besides convincing us of its worthlessness—it enables us to understand the preface in its fullest purport. We find the author is not likely to agree with us in believing that one great reason why little knowledge of natural philosophy has been diffused by our mechanics' and other institutions, is that the lecturers

provided have generally known so little of their subjects that their teaching has served rather to confound than to enlighten their audiences. The reason is not the want of suitable works, for there are many good books on the subject, but that lectures have been too much like Mr. Hunt's book. Again, we learn why Mr. Hunt regards mathematics as not absolutely necessary to the perfect understanding of physical science. It becomes evident that he has never thoroughly known the difficulties to be overcome in obtaining definite and clear ideas on these matters, for he has plainly never gone through the process; no man with a tolerable knowledge of applied mathematics could possibly write the nonsense which he has written. Mr. Hunt's great mistake evidently is, thinking that he himself understands elementary physics at all. This primary blunder explains, if it does not excuse his subsequent errors. It is proved by the gravity with which he puts forth propositions in direct contradiction of ascertained laws. His want of some little knowledge of the exact sciences has plainly prevented him from mastering sufficiently the laws deduced by their means from observed facts to enable him to give anything like an *approximately correct*, much less a *clear* statement of them. It is generally true that the least worth is associated with the most pretension; and here we have no exception to the rule. Instead of the accurate information promised us in the preface, we find in the book scientific phraseology abused, nonsense put for science herself, and to nature, laws ascribed which are altogether ridiculous. Of course, we shall not fail amply to justify this severity—a severity merited the more because the author has persisted in his errors by publishing thus a second edition of a work, the fact of whose appearance at all was quite a sufficient disgrace, both to him and to the learned societies to which he belongs. How far Mr. Bohn is to blame for introducing into his scientific library a pseudo-scientific work, which may taint the reputation of the whole collection, we cannot say.

The first chapter is on the general properties of ponderable matter, and is a very heterogeneous mixture of a little statics, dynamics, strength of materials, hydrostatics, hydrodynamics, optics, astronomy, &c. We shall cull the first specimens of our author's performance from the definitions given in this chapter. We choose the following from many of their kind:

"The distinctions between the *liquid*, the *vapour*, and *gas*, are principally determined by the conditions of resistance which these bodies offer." Of course, we know that such *a sentence* cannot mean anything which is true, although we are not able to assign it any definite meaning at all. The distinction between liquid, gas, and vapour have nothing whatever to do with their resistances.

"Extension — The capability of being spread out."

"Density—Hardness and heaviness."

These two definitions speak for themselves; but here is one worthy of a little more regard, as we may, perhaps, hit upon its purport.

"Inertia—A body at rest cannot be moved without the application of a certain amount of force; the quantity of force applied, therefore, to move the body, is a measure of its inertia—the force which keeps it at rest."

On this we remark, in the first place, that a body does not require any definite amount of force to move it when nothing but its inertia is in question, but will move under the action of any force whatever; and hence, in the second place, the use of the conjunction, therefore, which follows, is utterly absurd; and thirdly, that the inertia is not a force at all, but that quality by reason of which it refuses to change its condition of rest or motion without a cause proper and adequate to the mode and degree of the change. These four specimens have been taken from two consecutive pages (6 and 7.) On page 8 we have the following about gravitation:—"It is the force which draws a small body, set free to move, to a larger one." This implies, of course, that the force of gravitation does not act except one of the bodies concerned is free to move, and that one less than the other. Page 9, we have: "Dynamics is the science which belongs to matter in motion; a force, or power undisturbed, or balanced, is said to be a *statical force*, whilst in activity it is termed a *dynamical force*." Now there are no such forces known to science; such distinctions are worse than useless.

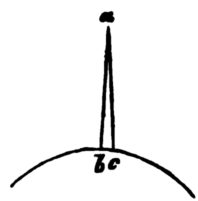
But turn we to glance at the exposition of rotary motion and centrifugal force (pp. 11—15.) From the fact that motion in cases like that of the governors of a steam engine causes bodies to separate, our author has arrived by induction at the principle that all motion is inimical to aggregation. Thus he says, "It may be difficult to conceive how light bodies, free to move, are not thrown off from the surface of the earth into space, under the influence of motion. It will be shown that the power of gravitation is so nicely balanced against the result of the earth's revolution, that the lightest down floating on the air swims in the calm equilibrium of two forces apparently undisturbed." This proves Mr. Hunt ignorant, 1st. That the earth's attraction and the centrifugal force at her surface produced by

her rotation do not act in the same straight line, except where the horizon is parallel to the axis. 2nd. That the centrifugal force varies directly as the cosine of latitude. 3rd. That at its maximum—that is, at the equator—it is a very small part* of the force of gravitation. Speaking of the results of cohesive attraction, "In these results," says Mr. Hunt, "we have conclusive indications of a power by which matter is aggregated or collected into masses—of a force acting in opposition to the force belonging to motion."

Here is a statement the hardihood of which is seldom matched:—"We have now learned that *all matter*, in *whatever form* we find it, is held together by a force which we call COHESION"!! Has Mr. Hunt ever heard of such a body as steam or atmospheric air? On the same page (42), "It signifies not whether we throw a pound of iron or a pound of chalk into the air; they are each alike drawn back to the earth with the same velocity." Everybody knows this is untrue—the resistance of the air acting differently on the two bodies, according to their forms and densities. Pages 46, 47 we have an offence against elementary mechanics, which proves the author's thorough incapacity to treat any physical subject whatever. He says, "This attraction (that of gravitation) is measured by the space through which it draws a body in a given time. The attraction of one body upon another does not depend upon the *mass of the body which is attracted*, but is the same whatever be the mass of the body so attracted, at the same distances. If the earth and the sun were equidistant from Jupiter, the influence of that planet would be the same on each, and would draw them through the same space in the same time. Again, this attraction is proportional to the mass of the body which attracts, if the distances of the different attracting bodies be the same. Supposing the sun, which is very much larger than Jupiter, to draw the earth through a given number of inches in a second, Jupiter being at the same distance from the earth as the sun, would draw it through a considerably smaller space in the same time." The grammar of this curious extract we will allow to tell its own tale, and point out, for Mr. Hunt's sole benefit, the propriety of attaching a negative to almost every sentence of this passage. In the first place, no force is ever measured by the space through which it draws a body in a given time, but always by the momentum which the said force would generate in a given time, if it acted uniformly during that time; that is, by the product of the mass of the body and the velocity generated in that time, on the same supposition. Again, the attraction of two bodies for each other does depend upon the mass of *both* those bodies, and, in fact, varies as the product of their masses divided by the square of the distance between their centres of gravity, and so on.

But let us turn to the next page, where we find some definitions which openly set all the first principles of geometry at defiance. "If we cut a cone perpendicularly to the base, the section is a triangle." "If we cut the cone parallel to the axis perpendicularly from the vertex, making a greater angle with the base than is made by the side of the cone, the figure obtained is a hyperbola." It is not an easy thing to understand how a man who has been associated with scientific institutions for any length of time could have *preserved* himself so utterly ignorant of the elements of geometry *as to be able* to use scientific terms in this ridiculous way. On pages 49, 50 is a theory of "balance of power" in the solar system, which is wholly false. Page 52 affords us an example of hardy ignorance from which common sense ought to have protected even Mr. Hunt. This is it:

"As the earth rotates from east to west, each point of her surface describes an arc proportional to its distance from her axis; therefore (how therefore?) a falling body has, from the beginning of its fall, a tendency eastward; that is, if *a b*, be a well-ascertained perpendicular, and a body is set free to fall from *a*, the point, *b*, being carried

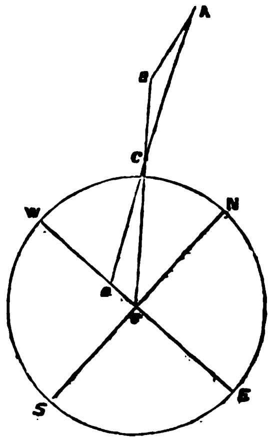


forward by the earth's rotation, the body will fall along such a line as *a c*. Experiments of this class have been made by Gulielmini, Benzenberg, Reich, and Oersted, which give a deviation to the east of the true perpendicular of 3·95 French lines. These results have been confirmed by experiments in some of the deep mines of Cornwall. Beyond this, a deviation to the southward of the true perpendicular has been detected, which deviation does not admit of that easy explanation which the direction of the earth's motion enables us to give of the former." This reminds us of a passage in the "Weather Almanack" of the immortal Mr. Murphy, for the year 1838. "It must appear singular," says the weather prophet, "considering the emi-

* At the equator, the centrifugal force is ·1117—gravity, 32·2.

nent men who have so long directed their attention to the subject, that a fact so startling and important should have so long, as it were, escaped their observation; and which of itself were sufficient to overthrow, by showing the total insufficiency of, the Newtonian theory." Perhaps our readers would have been inclined to regard Mr. Hunt's assertion that the earth revolves from east to west as a typographical error if we had not laid before them the whole of the paragraph in which it occurs. It will be perceived (however surprising the fact) that this hypothesis is altogether necessary to the subsequent arguments, and hence we must infer, that it is Mr. Hunt's serious opinion that the earth revolves from east to west! It is a fact, that a body falls to the east of the perpendicular, and our author can only account for this by supposing the earth to move in a manner exactly opposite to that in which we all believe the motion to take place. This hypothesis, we think, would tend considerably to complicate astronomical matters. How, for instance, could the fact that the sun rises in the east and sets in the west be shown consistent with it? To account for the actual mode of the deviation of the path of a falling body from the perpendicular, it is usual to adopt a course of argument altogether different from that pursued by Mr. Hunt. We should say, because the earth revolves *from west to east;* because the point *a* is situated at a greater distance than *b* from the axis of rotation; and because the body at *a*, before it is set free to move, is in rigid connection with the earth; therefore, the said body at *a* has a greater velocity of translation towards the east than has the point *b*, the foot of the "well-ascertained perpendicular" let fall from *a*. Hence it is that when the body is set free to fall from *a*, preserving this velocity, it leaves the point *b behind*, and falls to the east of it, because of the superior velocity to the eastward which the falling body possesses over the point *b*. So that instead of being left behind by the foot of the perpendicular, the body outruns it.

Perhaps it was prudent not to attempt to explain the deviation to the southward (in north latitude) for it is most probable that if any method had been hit upon, it would have been one requiring an hypothesis in thorough discord with that which precedes. But we can assure Mr. Hunt that it is not difficult to explain this phenomenon to the satisfaction of many who imagine they understand these matters. Here we think we shall have difficulty in rendering the mode of explanation intelligible to our author, because we regard this as a question to the full understanding of which some considerable mathematical knowledge is indispensable. We will do our best, however, to make ourselves understood by our readers. To this end, we must use the accompanying rather exagge-



rated diagram. Suppose W N E S is a meridional section of the earth; S N her axis. Let B and C be two bodies in connection with the earth, and so placed that the line of the earth's attraction on each shall pass through the centre of gravity of the other; that is, so that B C and *c* may be in the same straight line (*c* being the centre of gravity of the earth). Now we may regard each of these bodies as virtually under the action of two forces, the attraction of gravitation in the direction C *c*, and the centrifugal force in the direction, *c* W. Let us begin with C. Suppose C *c* to represent in magnitude as well as direction the attraction of gravitation on C, and C *c*, in a similar way represent the centrifugal force on the same body; join C *o*, then C *o*, is the direction of the resultant force on C, and it is plain that, the latitude constant, the greater the ratio which *o c* bears to *c* C, that is, the greater the ratio of the centrifugal force to that of gravitation, the greater will be the angle, *o* C *c*. And passing to B, we observe that, since the forces acting on B are in the same direction as those on C, and since the greater distance of B, from the axis, S N, renders its centrifugal tendency greater, while the increased distance from the centre of gravity of the earth, *c*, renders the attraction of gravitation less than that belonging to the body, C, therefore the ratio of the centrifugal to the gravitating force is greater for B than for C, and hence the inclination of the resultant force on B, to the south of the line, B C *c*, is greater than that of C *o*, and this resultant would

set in such a line as A B. It is plain that, if these two lines be produced upwards, they will meet in some point, A. If two strings be now attached to B and C, and both made fast at the point, A, which is supposed rigidly connected with the earth, we have the remarkable phenomenon of two plumb lines hanging from the same point and not coinciding. If, while we shorten AB, we keep C the same, the angle BAC increases. Thus, taking AC to denote a "well-ascertained perpendicular," we perceive that we are not altogether at a loss for a reason why a body falling from A, should strike the earth to the southward of C.

On the page occupied by the foregoing extract, we observe, in contradiction to what is stated before, that "all bodies mutually attract each other." On the same page (53) commences a loose and wrong account of tides. On the next we read, "At the times of the new and full moon the tides are sensibly affected; *these* are called *spring*, producing the highest and lowest water, and *neap* tides, which neither rise so high nor fall so low." This is a harmless error in one sense, because everybody knows the truth it misrepresents. Neap tides of course happen midway between the new and full moon.

We have hitherto chosen passages containing errors of unequal importance, simply because they occurred together, and we desired to show how densely such errors are crowded into the book. We cannot, nor would it be desirable to, proceed through the book in this way, as to do so would amount to the publication of a corrected edition of a work, the arrangements of which remind one of the average order exhibited in a well-shuffled pack of cards. We will just point out the pages where more may be found, and transcribe and correct those which may be sufficiently absurd to amuse, or important enough to interest our readers. On page 56 a body falls 15 feet in a second; on 58, it falls rather more than 16 feet in the same time. On 57, is an unintelligible account of Attwood's machine, which must be wrong, because Attwood's machine is not unintelligible. On 59 is given a false reason for the floating of a feather in the air. On 63 we have the solecism, "a force exactly equal to the superiority of its mass over that of the feather;" and on 74, this one; "the *line* of equilibrium, which we call the centre of gravity." We need say no more about this chapter, except that it closes at page 78.

The next chapter treats of the general laws of motion, though those laws have been assumed, or ought to have been assumed, in a variety of cases of motion considered in the first chapter. We must give the opening paragraph entire, as it affords a convincing proof of how thoroughly loose and rotten must be the physical knowledge which is associated with such notions of the first laws of motion.

"The most perfect exemplification of the primary law of motion, is the rotation of the earth itself. The law, as expressed by Newton, is, *that a body at rest continues at rest, and that a body in motion goes on moving without altering its velocity or direction*, unless compelled by some extraneous forces to change it. A ball discharged from a rifle does not move for ever, however great may have been the force by which it was impelled. Here we have the resistance of the air (*friction*) and the power of gravitation acting extraneously to reduce the force of motion, and bring the body to a state of rest. All motion is the result of some mode of force; and in the example of the earth's rotation, although we cannot clearly define all the causes at work, there can be no doubt but its uniformity is due to the constant expenditure of some external force. Laplace's calculations show that it is impossible that a difference of one-hundredth of a second can have taken place in the length of the day since the most remote antiquity. Now, although the earth's motion has been usually referred to the first law, this wonderful regularity appears to indicate the operation also of the second and third laws of motion. These are—When a force acts on a body in motion, it produces the same effect as if the same force acted on a body at rest;—and, when a force of the nature of pressure produces motion, the velocity produced is proportional to the force, other things being equal." Why Mr. Murphy himself could not have written such nonsense as this!

Mr. Hunt is very apt at an absurd definition. Page 82, he says, "*Rectilinear motion* is the movement of points in parallel lines." It is no such thing. Page 83 contains a caricature of one of Newton's corollaries, and a proof of the uniform darkness of the author's ignorance:

"In the great work of Newton, the Principia, the first corollary is, 'a body describes the diagonal of a parallelogram by two forces acting conjointly, in the same time in which it would describe its sides by the same forces acting separately.'" Then follows a pretended illustration, which seems to have no relation either to this stupidly-stated principle or to anything else. It is really too bad to ascribe such stuff to Newton. On page 84 we have similar absurdities. On page 85, the principles of the inclined plane are wholly misrepresented. On page 86, Mr. Hunt speaks of an ignorant

man, who "might project a road over the summit of a mountain." The reader will not fail to see, that if Mr. Hunt cannot be identified with the "ignorant man," whom he often introduces, it is because he, Mr. Hunt, is much more ignorant than even that benighted personage. On page 87, geometrical terms are again abused. On pages 94, 95, 96, we find friction treated in a mode harmonizing very well with the rest of the book; it is "nothing more than the exercise of cohesion and gravitation." * * * "Wherever matter exists, we have friction."

Here is something new about shot:

"A perfectly spherical shot projected from a cannon, where the explosive force is exerted on one hemisphere only, is driven round with enormous velocity in its flight."

Two more sentences, which are considerably superior to many other parts of the book in point of composition and grammar, though they are not much so in their relation to truth:

"No form of matter can move without the application of a *force*, and as soon as the power supplied is expended, the body comes to rest." * * * * *

"It is, however, most important again to impress the fact, that motion cannot produce a *force*, and that a force must be exerted to produce motion."

This last is a worthy conclusion to the second chapter. We have now arrived at page 103, and have, we think, justified our sentence against the book. It will be our duty, however, to show in a future paper, by a less minute examination, that the same disease prevails through the rest of the volume.

(*To be concluded in our next.*)

RE-PATENTING OF THE LAZY-TONGS AS APPLIED TO THE WORKING OF PUMPS.

To the Editor of the Mechanics' Magazine.

SIR,—At page 426 of your last number, by an extract from the Specifications recently filed, we learn that a patent has been taken out by Messrs. Wetherell and Hoffstaedt, for "an improved construction of pump;" the improvement consisting in the employment of a lazy-tongs arrangement of levers for transmitting the reciprocating motion of the pump-handle to the piston-rod, for the purpose of increasing the length of the stroke.

On referring to page 413 of your 54th volume, it will be seen that Mr. Joseph Nye took out a patent for precisely the same arrangement on the 12th of November, 1850. Mr. Nye's patent, therefore, secures to him *the "sole use"* of this invention (if it has any practical value) for nine years to come, to the exclusion of Messrs. Wetherell and Hoffstaedt's claim.

At page 353 of your 56th volume there is an account of an important and interesting trial of Mr. Nye's lazy-tongs worked pumps, when this much-vaunted method of converting a short stroke into a long one proved to be a fallacy—"introducing a complexity of parts, entailing enormous friction, increased wear and tear, and great liability to derangement."

I believe the result of this trial was the abandonment of the scheme, and the dispersion of the machines by the auctioneer's hammer! The dear-bought experience of the first patentee may, perhaps, be of service to the gentlemen who seem following so very closely in his footsteps.

I am, Sir, yours, &c.,

W. BADDELEY.

13, Angell-terrace, Islington,
May 7, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

PLATT, JOHN, of Oldham, Lancaster, mechanical engineer. *Improvements in machinery or apparatus for making bricks.* Patent dated October 19, 1854. (No. 2238.)

Claims—1. The application to brick machines with travelling moulds of hoppers with suitable apparatus for determining the supply of material by opening and shutting the orifices through which it passes. 2. As applied to the machine patented by James McHenry, July 20, 1852, the use of suitable apparatus for drawing down the pistons within the moulds. 3. Sweeping off the pressed bricks by means of an apparatus which arrives in contact with one portion of the range at a time.

BIGGART, THOMAS, of Dalry, Ayr, spinner, and ALLAN LOUDON, of the same place, mechanic. *Improvements in regulating motive-power engines.* Patent dated October 19, 1854. (No. 2239.)

This invention relates to mechanism to be employed in connection with the ordinary ball or other similar governor of motive-power engines for the purpose of securing a uniform rate of working, "and consists in connecting the lever of the throttle-valve or steam current regulator with a rack in gear with a pinion, which is made to turn in either direction, and so open or shut the throttle-valve when the speed of the engine varies from the regular rate."

ALLAN, THOMAS, of Adelphi-terrace, Westminster, civil engineer. *Improvements in applying electricity.* Patent dated October 20, 1854. (No. 2243.)

This invention comprises a mode of constructing the breaks or valves of electro-magnetic engines; a mode of arranging the polarities of many-poled or accumulative electro-magnets applicable to direct-attraction electro-magnetic engines; the employment of a crosshead slide and sliding-bush in such engines; the employment of a ratchet-wheel and double-pawl arrangement for producing rotation in the shaft of an electro-magnetic engine from the direct-attractive reciprocating motion of electro-magnets; and the substitution of magnets for keepers in the employment of magnets arranged in pairs; some or all of which improvements we shall probably describe at length shortly.

SMITH, JULIUS, of Gainford-place, Barnsbury-road, and FRANK SANDOM THOMAS, of South-terrace, Walworth. *An improved apparatus for steering ships and other vessels.* Patent dated October 21, 1854. (No. 2245.)

This invention consists in interposing between the rudder head and the screw or the tiller a hollow cylinder containing a conical volute spring, which is actuated by the mechanism connected with the screw or the tiller.

SMITH, WILLIAM JOSEPH, of Stretford, Lancaster, salesman. *A certain improvement in buttons.* Patent dated October 21, 1854. (No. 2246.)

Claim.—The use of embossed "India-rubber cloths" for the purpose of coating or covering, either plain or ornamental buttons, the figuring, stamping or embossing, to be produced either before, at the same time, or after the button is covered.

JAMIESON, JOHN, of Oldham, Lancaster, engineer and millwright. *Certain improvements in steam engines.* Patent dated October 21, 1854. (No. 2248.)

This invention consists in the use of springs under the nuts which hold down the lids or covers of metallic pistons; in certain improved forms of pistons; in certain improved induction and eduction valves; and in certain means of working air-pumps, &c.

GREEN, WILLIAM, of Howard-buildings, Brick-lane, St. Luke's, Middlesex, engineer, and JOSEPH PICKETT, of Duke-street, London, manufacturer. *Improvements in treating or ornamenting textile materials or fabrics and paper, and in machinery or apparatus for effecting the same.* Patent dated October 21, 1854. (No. 2251.)

This invention consists—1. In producing upon continuous lengths of paper effects similar to those which on silk goods are designated "watered" and "shot." 2. In certain modes of producing upon textile fabrics and paper, by printing, effects similar to those which are produced by the "Jacquard" or similar apparatus. 3. In certain modes of producing patterns or designs with metal or dry powders, by first forming a suitable ground, and then rendering certain portions of the same adhesive by heat, or by moisture and pressure.

ABELL, EDWARD, of Lambeth, Surrey, gentleman. *An improved instrument to assist the hand in writing.* Patent dated October 23, 1854. (No. 2252.)

This invention consists in constructing a small instrument, a portion of which is in the form of a ring which slips over the forefinger, or the fore and middle fingers together, having underneath a short metal or other bar or projection, so situated, that while one end is within the hand, the other end of the bar projects outwards towards the thumb, there affording a rest or fulcrum, against which the handle or stem of the pen rests.

HALES, HENRY, of Brighton, Sussex, gentleman. *Improvements in the machinery for propelling vessels.* Patent dated October 23, 1854. (No. 2253.)

Claims.—1. Certain arrangements or combinations of eccentrics, connecting-rods, and drum-shafts, by which the power of the motive agent employed to work the paddle-wheels of a vessel may be also applied to work a screw-propeller or propellers in the same vessel. 2. The use of two screw-propellers of any description fixed upon the same shaft, one in the dead wood, and one abaft it.

SAVAGE, GEORGE, of Adderbury, Oxford, horse-breaker and clipper. *A new or improved singeing lamp.* Patent dated October 23, 1854. (No. 2254.)

The inventor describes a singeing lamp having a hollow handle opening into chambers, the connection between which is opened or closed by a stop-cock.

BRADE, ABRAHAM GERARD, of Paris, and Salisbury-square, London. *Improvements in the manufacture of plate and thread, for gold and silver lace and bullion.* (A communication.) Patent dated October 23, 1854. (No. 2255.)

This invention is a communication from Ambroise Auguste Masson, and forms an addition to his former invention patented January 11, 1854.*

MADDOX, JOHN, of Thomas-street, Brick-lane, EDWARD GARDNER, of Buxton-street, and GEORGE DYER GREEN, of Weaver-street, Middlesex. *Improvements in weaving fringes.* Patent dated October 23, 1854. (No. 2256.)

The object of this invention is that different widths of fringe may be woven at different times in the same space. "For this

* See *Mech. Mag.*, No. 1616, p. 113.

purpose," say the inventors, "the warps for two pieces of fringe are arranged side by side at a short distance apart, and several pairs of such warps are so arranged in number according to the width of the loom employed. Each shuttle carries the weft to weave two pieces of fringe, which are afterwards divided by cutting through the weft-threads which connect them together, as is well understood. The width of fringe to each pair of warps is governed by the action of an adjustable instrument or pusher (there being one of such instruments to each pair of warps) in connection with a frame which receives a to-and-fro movement by means of cords and pullies connected to a lever arm fixed to the batten, or in any other convenient manner."

PENN, JOHN, of Greenwich, engineer. *Improvements in the manufacture of the pistons, slide-valves, and stuffing-boxes of steam engines.* Patent dated October 23, 1854. (No. 2258.)

This invention consists in constructing the pistons, slide-valves, and stuffing-boxes of steam engines with wood packings.

SCOTT, JAMES, of Argyle-square, Edinburgh, M.D. *Improvements in apparatus for facilitating surgical operations and teaching anatomy.* Patent dated October 23, 1854. (No. 2259.)

The inventor describes an apparatus on which patients may be laid when they are to undergo operations, &c., which apparatus is fitted with a horizontal screw, by means of which a pressure may be exerted upon a particular part.

COWPER, CHARLES, of Southampton-buildings, Middlesex. *Improvements in preparing to be spun, and in spinning silk waste.* (A communication.) Patent dated October 24, 1854. (No. 2261.)

Claims.—1. "In preparing silk waste by the combined and successive operations of first opening and parallelizing the fibres, then cutting them to a suitable length for being combed, and afterwards combing them. 2. Preparing and spinning silk waste in a wet state after previously opening and parallelizing the fibres, cutting them to a suitable length, and combing them," &c.

BOUWENS, FRANÇOIS JEAN, of Mechlin, Belgium, architect. *An improved rotary engine.* Patent dated October 24, 1854. (No. 2262.)

This invention consists in the construction of a rotary engine in which a series of pistons traverse an annular chamber, the sliding motions of these pistons, by which they are projected after passing by the steam stops, being produced by the direct action of the steam upon them.

SOMERBY, GUSTAVUS ADOLPHUS, and CHARLES WILLIAM FOGG, of Massachusetts, United States of America. *An improved brake apparatus for railway carriages.* Patent dated October 24, 1854. (No. 2263.)

Claim.—"In combination with a brake mechanism and a wheel made to move, or made capable of being moved against and away from its rubber, as described, another brake mechanism so applied to the first brake mechanism and to the wheel, or to another wheel, as to be simultaneously set in action on its wheel with and by the other brake mechanism," &c.

ADAMS, ISAAC, of Massachusetts, United States of America. *New and useful improvements in machinery for printing.* Patent dated October 24, 1854. (No. 2264.)

The inventor describes an arrangement of apparatus for effecting—1. The distribution of the ink. 2. The pointing of the sheets on the feed-board or tympan. 3. The taking of the sheets from the feed-board, and the conveying of them in between the platen and form of types. 4. The producing of the impression. 5. The removing of the sheets from the press and laying them on the pile.

WARLICH, FERDINAND CHARLES, of Suffolk-street, Middlesex, gentleman. *Improvements in generating steam.* Patent dated October 24, 1854. (No. 2265.)

This invention consists "in employing tubular heaters (containing fluid combined with other matters) which are introduced into the tubular flues of steam boilers, or the tubular flues of other forms of vessels used for boiling or evaporating water or other fluids."

HOPKINSON, JOSEPH, the younger, of Huddersfield, York, engineer. *Improvements in steam engine boilers and safety-valves, and in apparatus for indicating the vacuum in steam engine condensers, in relation to the existing atmospheric pressure.* Patent dated October 24, 1854. (No. 2266.)

Claims.—1. So arranging a series of boilers in communication with each other that their lower parts shall constitute two or more levels, forming a wavy line, so as to expose the sides of the boilers against which the products of combustion are caused to impinge by means of bridges, such products of combustion being prevented from passing between the boilers. 2. A double safety-valve described, the one constituting a seat for the other. 3. The use of a column of mercury with communications capable of being opened at pleasure to the atmosphere and to the condenser.

WELSH, JOHN, of Greenock, Renfrew, sergeant of police. *Improvements in extracting liquids from saccharine and other matters.* Patent dated October 24, 1854. (No. 2267.)

Claim.—The mode of extracting liquids

from saccharine, and other matters by exhausting or partially exhausting the air from one side or part of the mass under treatment, so as to cause a preponderance of atmospheric pressure on any exposed part of such mass, and thereby cause the syrup or liquid to drain through in the direction of the exhaust action.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HIGGINS, THOMAS, of Liverpool, Lancaster, commander, Royal Navy. *Improved apparatus applicable to the ventilation of ships and mines and other useful purposes.* Application dated October 19, 1854. (No. 2240.)

This invention consists in employing two circular tubes or pipes in which are placed shafts with screws formed upon them so as to fill the space within the pipes, or nearly so. The screw shafts are mounted upon suitable bearings, and are each provided at the upper end with a fan-turncap which is acted upon by the wind and gives motion to the screw-shafts.

MARSH, WILLIAM, of Bywater-street, King's-road, Chelsea, Middlesex, upholsterer. *An improved rocking and lounging chair.* Application dated October 20, 1854. (No. 2241.)

This invention consists in constructing a lounging chair which is capable of different degrees of elevation and inclination, and also of being folded up into a small compass when required..

CHENU, LOUIS AUGUSTE, baker, and FRANÇOIS FREDERIC PILLIAS, contractor, of Fontainebleau, French Empire. *Certain improvements in preserving animal substances.* Application dated October 20, 1854. (No. 2242.)

This invention consists in preserving meat, &c., by cutting it up, immersing it for about two minutes in boiling water, draining it for about a minute in a perforated vessel, plunging it for a second in a bath of water and sal-ammoniac, and then drying it for twenty-four hours in a stove kept at a temperature of 138° Fahr.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in machinery or apparatus for stitching.* Application dated October 21, 1854. (No. 2244.)

This invention consists in balancing, or nearly balancing the arm, slide, or lever which actuates the needles in stitching-machines, and in imparting a lateral motion to them, &c.

EDWARDS, WILLIAM ALEXANDER, of Brooke-street, West-square, Lambeth, Surrey, engineer. *Separating iron or steel from brass, gun-metal, and all other metallic filings.* Application dated Oct. 21, 1854. (No. 2247.)

The inventor employs electro-magnetism as a means of separating iron and steel from other filings.

BRADE, ABRAHAM GERARD, of Paris, France, and Salisbury-square, London. *Improvements in the manufacture of gas-fittings.* (A communication.) Application dated October 21, 1854. (No. 2249.)

This invention consists in ornamenting gas tubes by passing them into hollow moulds of ornaments, and pouring the melted metal in while the tubes remain in that position, by which means the castings are made to adhere to the tubes.

HEYWOOD, BENNETT JOHNS, of Green Mount-cottage, Dalkey, near Dublin, Ireland, gentleman. *Improved apparatus for affixing postage and other stamps to envelopes, letters, and other documents.* Application dated October 21, 1854. (No. 2250.)

In affixing stamps by means of this improved apparatus the paper to be stamped is laid on a pad (moistened by capillary action) and pressed upon it by means of a sliding frame; it is then laid upon the upper end of a pile of adhesive stamps, the gummed surfaces of which are uppermost, and again pressed by a sliding frame.

SIMMONS, GEORGE, of Liverpool-street, London, civil engineer. *Improvements in the construction of railway bearers and sleepers.* Application dated October 23, 1854. (No. 2257.)

The inventor constructs bearers and sleepers of two angle irons combined with plates at the top and bottom by means of rivets or bolts, or by the rails of the railway.

MARIE, EDME HYPPOLITE, of Paris, French empire, professor of physics. *Certain improvements in the machinery for preparing, spinning, and twisting cotton, silk, flax, wool, and other fibrous substances.* Application dated October 23, 1854. (No. 2260.)

In carrying out this invention "the cotton or other fibrous substance, in the state of a band, sliver, or roving, is passed between two drawing rollers which are placed one beyond the other in the direction in which the roving is moving," &c.

SPENCER, JOSEPH, of Bilston, Stafford, iron-founder. *A new or improved fence for railway stations, docks, and such other places as the same is or may be applicable to.* Application dated Oct. 24, 1854. (No. 2269.)

On the edge of the platform or in any other convenient place, the inventor fits a series of uprights turning upon joints situated a little below the level of the platform. These uprights are capable of motion in a vertical plane parallel to the edge of the platform. A rail or bar connects all their upper ends together, and when it is desired the whole may be lowered down level with the joints.

PROVISIONAL PROTECTIONS.

Dated February 23, 1855.

400. John Norton, of Dublin, Ireland, esquire. Improvements in the construction of cartridges for fire-arms.

Dated March 1, 1855.

456. Thomas Kennedy, of Kilmarnock, Ayr, gun manufacturer. Improvements in wadding for fire-arms.

Dated March 5, 1855.

491. Charles Lowell Fowle, of Massachusetts, United States of America. New and useful improvements in machinery for sewing cloth, leather, or other material. A communication from Edwin A. Forbrish, of Massachusetts.

Dated March 9, 1855.

539 William Smith, of Salisbury-street, Adelphi, Middlesex. Safety harness. A communication.

Dated March 15, 1855.

583. Nathan Robinson, overlooker, John Lister, mechanic, and Henry Stevenson, pattern-maker, all of Bradford, York. Improvements in looms for weaving cocoa-nut matting and similar fabrics.

Dated March 26, 1855.

672. Carl Armbruster, of Andermach, Rhenish Prussia, proprietor of mines, and Otto Laist, of Pfeddersheim, in the Grand Duchy of Hesse, chemist. Improvements in the manufacture of sulphate of soda.

Dated March 28, 1855.

681. Francis George Mulholland, of Vincent-square, Westminster, civil engineer. An improved mode of constructing fireproof and waterproof roofing, flooring, and covering for general purposes.

683. James Higgin, of Manchester, Lancaster, manufacturing chemist. The use of a thickener for mordants and colours for printing woven fabrics, which thickener has not been hitherto used for such purposes.

685. William Hutchison, of Tonbridge Wells, Kent, stone merchant and indurator. Improvements in manufacturing artificial stone, and in giving colour to the same.

687. Joseph Revell, of Dukinfield, Chester, plasterer. Certain improvements in machinery or apparatus for propelling vessels.

689. George Hall Nicoll, of Dundee, Forfar, ironmonger. Improvements in laundry stoves.

691. William Henry Gauntlett, engineer, of Banbury, Oxfordshire. Improvements in apparatus for cutting or pulping turnips and other roots.

Dated March 29, 1855.

693. Frederick William Mowbray, of Shipley, near Leeds, York, engineer. Improvements in bearings for the axles of railway-wheels, and of other axles or shafts, which improvements are also applicable to axles or shafts, and other like rubbing surfaces.

695. François Joseph Anger, of Stamford-street, Blackfriars-road, Surrey, merchant. Improvements in the preservation of vegetable substances.

697. Walter Brown, of Catherine-street, Cornwall-road, Lambeth. Improvements in the manufacture of sheet metal casks and kegs.

699. Alexander McDougal, of Manchester, Lancaster, manufacturing chemist. An improved method of consuming smoke in steam-engine or other furnaces or fire-places.

701. Alexander Dalgety, of the firm of Dalgety and Ledger, of Deptford, Kent, engineers. Improvements in steam-engines.

703. Robert Johnson, William Whittle Johnson, and Robert Johnson the younger, of Waterloo-place, Commercial-road, Middlesex. A new and improved covering for surfaces, linings, roofs, and spaces.

Dated March 30, 1855.

705. Anatole Bère, government mining engineer, of Lille, France, Improvements in steam-boilers.

709. William Tytherleigh, of Birmingham, Warwick, clerk of works. The application of a certain well known process to the covering of iron, in sheets or bars, with copper or copper alloys, whereby he produces a new and useful product.

711. Manning Prentice, of Stowmarket, and Thomas Richardson, of Newcastle-on-Tyne. Improvements in the manufacture of manures.

713. Manning Prentice, of Stowmarket, and Thomas Richardson, of Newcastle-upon-Tyne. Improvements in the manufacture of manures.

715. Theophilus Wood Bunning, of Newcastle-upon-Tyne, engineer. An improvement in steam-engines.

Dated March 31, 1855.

717. Andrew Shanks, engineer, of Robert-street, Adelphi, Westminster. Certain improvements in hand drilling machines.

719. John Bailey Surgey, of Lidlington-place, St. Pancras, Middlesex. Improvements in instruments for threading needles.

721. Robert Hardman, of Bolton-le-Moors, Lancaster, mechanic. Certain improvements in looms for weaving.

725. Thomas Russell Crampton, of the Adelphi, Middlesex. Improvements in locomotive and other steam boiler furnaces. A communication.

727. Thomas Hedgcock, of Cavendish-grove, Wandsworth-road, Surrey, master Royal Navy. An improved quadrant for taking solar altitudes for latitude without aid of marine horizon, and for ascertaining the true longitude.

Dated April 2, 1855.

729. Frederick Phillips, of the Hall Farm, Downham, near Brandon, Suffolk, land agent. Improvements in machinery or apparatus for distributing manure, sowing or depositing seeds, and effecting the working and cultivation of land.

731. John Taylor, of Spring-grove, Hounslow, Middlesex. An improvement in the manufacture of covers for books.

733. Robert Stirling Newall, of Gateshead-on-Tyne, wire-rope manufacturer. An improvement in the standing rigging of ships and other vessels.

735. George William Friend, of High Holborn, Middlesex, umbrella and parasol manufacturer. Improvements in umbrellas and parasols.

Dated April 3, 1855.

737. François Theodore Botta, of Paris, brewer. Improvements in the method of, and apparatus for, beer brewing.

739. Henry Chapman, of Kingsland, Middlesex. An improved electro-mechanical apparatus for supplying and adjusting the electrodes used in the production of the electric light.

741. Peter Rothwell Jackson, of Salford, Lancaster, engineer. Improvements in machinery for making patterns and for moulding therefrom.

743. William Henry Tooth, of Pilgrim-street, Kennington-lane, Surrey, engineer. Certain improvements in the construction of floating vessels, and in the machinery and steam signals connected therewith, and in the application thereof to other purposes.

747. James Cowen, of Greycoat-street, and James Sweetlong, of Earl-street, Westminster. A locomotive land battery.

749. Frederick Joyce, of Upper Thames-street, London, percussion-cap manufacturer. Improvements in the manufacture of percussion-caps and other primers.

751. Samuel Greenwood, of Sunderland, Dur-

ham, engineer. Improvements in machinery for making rivets, bolts, nuts, and other similar articles.

Dated April 4, 1855.

753. John Crowley, of Sheffield, York, ironfounder. Improvements in the manufacture of malleable cast iron.

755. Louis Ambroise Michel Mouchel, of Paris, France, and 166, Fleet-street, London, merchant. An improved method of joining pipes, tubes, and ducts. A communication.

Dated April 5, 1855.

757. William Goostrey and George Hulme, of Chedderton, Stafford, paper manufacturers, and Charles Hough, of the same place, manager. Improvements in machinery or apparatus for manufacturing paper.

759. James Chesterman, of Sheffield, York, manufacturer. Improvements in the manufacture of table and other like knives.

761. Charles Goodyear, of Avenue Gabriel, Champs Elysées, Paris. Improvements in self-inflating pontoons and life-preservers.

763. Joseph Edwin Frost, of Goswell-street, Middlesex. An improvement in ball or float-cocks.

765. Herbert Mountford Holmes, of Derby. Improvements in the manufacture of tires for wheels.

767. Anguish Honour Augustus Durant, esquire, of Tong Castle, Salop. An improved axle and axle-box for carriage-wheels, shafts, axles, or general bearings of machinery.

Dated April 7, 1855.

769. William Bennett Hays, of Cambridge-street, Pimlico, Middlesex, civil engineer. An improved breakwater.

771. Henry Gerner, of Moorgate-street, London, architect. Improvements in polygraphic or writing and drawing apparatus.

773. Joseph Hull, of Liverpool, Lancaster. Improvements in the machinery and apparatus for grinding corn.

775. Richard Husband, of Manchester, Lancaster, hat manufacturer, and George Mallinson, of the same place, pattern designer. An improvement in the manufacture of hat-plush.

777. George Walker, of Belfast, Antrim, spinning manager. An improvement in power-looms.

Dated April 9, 1855.

779. William Tuer, William Hodgson, and Robert Hall, machine-makers, and Samuel Hall, foreman, all of Bury, Lancaster. Certain improvements in looms for weaving.

781. David Cope, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of metallic spoons, forks, and ladles.

783. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in pumps. A communication from John Hoyes McGowan, junior, of Cincinnati, United States.

Dated April 10, 1855.

785. Samuel Fielding the younger, of Green, Rochdale, Lancaster. Improvements in apparatus for oiling or lubricating the pistons of steam-engines.

787. Alexander Chaplin, of Glasgow, Lanark, engineer. Improvements in steam boilers and in the combustion of fuel.

789. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for preparing cotton and other fibrous substances. A communication from Jean Beugger, of Wulflingen, Switzerland.

791. Lord Charles Beauclerk, of the Riding, Northumberland. Improvements in machinery for tilling and subsoil ploughing.

Dated April 11, 1855.

793. John Addison, of Basinghall-street, London, captain in the Honorable East India Company's service, and Duncan Sinclair, of Oxford-street, Middlesex, gentleman. Improvements in the manufacture of bayonet scabbards, sword-scabbards, pistol-cases, and holsters.

795. Leopold Oudry, electro-metallurgist and Alphonse Oudry, Imperial Government engineer, both of Paris, France. Certain improvements in preserving wood, metal, and other substances.

797. James Fletcher, of Facit, near Rochdale, Lancaster, manager. Improvements in and applicable to machines for spinning and weaving cotton, wool, and other fibrous materials.

799. Jean Vincent Marie Dopter, of Paris, France. Certain improvements in printing fabrics.

801. Samuel Holt, of Shaw-heath, Stockport, Chester, manager. Improvements in weaving plush or piled fabrics.

803. Philippe Amédée Devy, of Old Jewry-chambers, Old Jewry. Improvements in the construction of coke ovens. A communication.

805. James Lee Norton, of Holland-street, Black-friars. Improvements in separating wool and other animal fibres from vegetable matters, and in drying wool and other animal fibres.

Dated April 12, 1855.

809. Alfred Thomas Richardson, manufacturer, and George Mallinson, pattern designer, both of Manchester. Improvements in the manufacture of certain piled fabrics.

811. Isaiah Vernon, of West Bromwich, Stafford, manufacturer. An improvement or improvements in the slide-valves of steam-engines.

813. Alexander Cunninghame, of Glasgow, Lanark, iron-master. Improvements in the manufacture or production of sulphuric acid and sulphates of iron and alumina.

Dated April 13, 1855.

815. Jean Baptiste Bagary and Claude Perron, of Paris, France. New or improved knitting machinery.

819. Thomas Wimpenny, of Holmfirth, York, manufacturer, and Jonas Wimpenny, of Rawtenstall, Lancaster, surgeon. Certain improvements in machinery or apparatus for drawing and spinning wool, or wool mixed with other fibrous substances.

821. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in the treatment of fatty and resinous matters, and in preparing them for the manufacture of candles and other articles. A communication.

823. George Turner, of Northfleet, Kent. Certain improvements in the construction and fitting of tents and marquees.

Dated April 18, 1855.

850. Frederick Ludewick Han Danchell, of Arthur-terrace, Caledonian-road, Middlesex, engineer. Improvements in apparatus for increasing, exhausting, or regulating fluids and indicating pressure.

852. John Fordred, of Hampstead, Middlesex, gentleman. Improvements in the production of reflecting surfaces, and in the application of reflecting surfaces to decorative and useful purposes.

854. Richard Bridge, of Chadderton, Lancaster, manufacturer. Certain improvements in power looms.

856. Benjamin Cook, engineer, of Summer-row, Birmingham, Warwick. Certain improvements in the construction of horse-shoes, and which said improvements are also applicable to the shoeing of asses, mules, and oxen, when such are used as animals of draught, such shoes being applied in each case without the use of nails.

858. John Lawson, of Leeds, York, machine-maker, and Somerville Dear, of the same place, machine-maker. Improvements in machinery for combing and cleaning flax, tow, wool, and cotton, and other fibrous substances.

Dated April 19, 1855.

862. Dumont Pallier, of Broad-street, Lambeth, Surrey, grease manufacturer, and Edward Taylor, of the same place, manufacturing chemist. Improvements in the manufacture of soap.

864. Edward Howes, of Birmingham, Warwick, manufacturer, and Walter Howes, of Birmingham, manufacturer. Improvements in carriage lamps.

866. James Hindle, of Accrington, Lancaster, machine printer. Improvements in machinery or apparatus used in the process of printing woven fabrics.

868. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for crushing and grinding mineral and other substances. A communication.

870. William Jones, of Rhodes, near Middleton, Lancaster, machine printer. Improvements in printing calico and other fabrics.

872. François Jacot, of Rue du Jeuneuse, Paris. An improvement in the manufacture of starch, and in obtaining and treating the gluten.

874. John Atherton, of Preston, Lancaster, machine-maker, William Boyes, of the same place, manufacturer, and William Lancaster, of the same place, manufacturer. Improvements in temples employed in the manufacture of textile fabrics.

876. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in railway brakes. A communication.

Dated April 20, 1855.

878. Lucien Tardieu, of Rue de l'Echiquier, Paris, France, gentleman. A new mode of producing letters and figures for signs, show-boards, fronts of shops, houses, and other places.

880. Hypolite Macé, of Paris, France, merchant. Improvements in transferring colours or metals in design, on and from paper and stone on to surfaces. A communication from L. A. C. Macé, of Paris.

882. James Alexander Manning, of the Inner Temple, Middlesex, esquire. Improvements in effecting the agitation of fluids, and solid matters contained therein.

884. Samuel Cunliffe Lister, of Bradford, York, manufacturer. Improvements in treating the rhea-plant so as better to prepare its fibres before being spun.

886. Richard Bright, of Bruton-street, Westminster, lamp-manufacturer. Improvements in lamps and in lamp-wicks.

888. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for manufacturing bolts and other like articles. A communication.

Dated April 21, 1855.

890. Edwin Pettitt, of Manchester, Lancaster. Improvements in preparing and spinning cotton and other fibrous substances, and in machinery for such purposes.

892. William Hadfield, of Manchester, spinner and manufacturer. Certain improvements in looms for weaving.

894. John Barnett, of the Minories, London. Improvements in smiths' hearths. A communication from Jean August Petry, of Liège.

896. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the consumption or prevention of smoke. A communication from Rénó Garcon, of Paris, France, accountant.

898. William Winter, of Carlton-hill, Nottingham, manufacturer. Certain improvements in the manufacture of warp looped fabrics.

900. William Charles Theodore Schaeffer, of Bradford, York, manufacturer. Improvements in the treatment of the waste wash waters of wool and other mills.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

920. William Symington, of Little Bowden, Northampton, coffee-roaster. An improvement in preparing peas, and pearl and Scotch barley for culinary purposes. April 25, 1855.

954. Morris Lyons, of Suffolk-street, Birmingham, Warwick, chemist. An improved enamel for coating metals and bricks. April 27, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 8th,* 1855.)

2731. John Comstock. Improvements in trip-hammers.

2746. Andrew Dietz and John G. Dunham. Improvements in mowing and reaping machines, by which the sickle cutting the grain, is moved or worked directly by the driving-wheel or its equivalent, without the necessity of cog-wheels, cranks, &c.

2756. Eugène Mayeur. A new hydraulic pump or machine, based on the centrifugal principle, for the purpose of raising, forcing, or exhausting (even muddy) waters or other fluids, and applicable to the wants of agriculture, industry generally, and to the salvage of ships. A communication from Thomas Piatti.

2762. John Henry Johnson. Improvements in obtaining motive power. A communication from Jacques Eugene Armengaud, of Paris, France, civil engineer.

2764. Samuel Smith Shipley. Improvements in fittings suitable for dressing-cases, and for other purposes of elegance and utility.

16. William Kendall and George Gent. Improvements in machinery or apparatus for cutting metals, either solid or tubular.

21. Alexander Southwood Stocker and Samuel Darling. Certain improvements in the manufacture of bottles, pots, jars, tubes, and other receptacles, part of which improvements are applicable to various other purposes for commercial and domestic use.

37. Jean Baptiste Edouard Rüttre. Improvements in the treatment of rags and other goods formed partly of wool and partly of vegetable fibres, in order to separate the vegetable fibres from them, and obtain the wool in its pure state.

45. Robert McCall. Certain improvements in the manufacture of iron and steel.

46. Peter Armand Lecomte de Fontainemoreau. An improved mode of obtaining alcohol. A communication.

74. Robert Oxland. Improvements in the manufacture and revivification of animal charcoal.

96. Joseph Claudot. An improved stucco.

110. Henry Adkins. An improvement or improvements in bleaching or decolorizing oily and fatty bodies.

152. Maurice Delcamp. An improved apparatus for advertising or for the exhibition of placards.

160. William Eisenmann. A new construction for a hearth, applicable to all firing-constructions or fire-places.

179. James Webster. A new or improved method of changing the direction of and multiplying motion.

189. Charles Frederick Burnard. Improvements in the manufacture of super-phosphate of lime.

218. John Imray. Improvements in locks.

224. Alphonso Pichot. Certain improvements in postage-paper and envelopes.

238. Jacques Roux Delguey-Malavas. Improved machinery for obtaining and applying motive power.

321. George Rennie. Improvements in marine steam-engines.

341. Robert Molesworth. Improvements in the construction of brushes.

398. William Hartcliffe and Joseph Waterhouse. Certain improvements in looms for weaving.

400. John Norton. Improvements in the construction of cartridges for fire-arms.

456. Thomas Kennedy. Improvements in wadding for fire-arms.

491. Charles Lowell Fowle. New and useful improvements in machinery for sewing cloth, leather, or other material. A communication from Edwin A. Forbrish, of Massachusetts.

572. Edward Vincent Gardner. Improvements in furnaces, ash-pits, flues, and fire-places, whereby smoke is prevented, fuel more perfectly consumed, and its heating value greatly economised.

603. Thomas George Shaw. Improvements in apparatus to facilitate the "tilting" of casks, barrels, or other similar vessels of capacity.

679. Archibald Turner. Improvements in the manufacture of elastic fabrics.

693. Frederick William Mowbray. Improvements in bearings for the axles of railway-wheels, and of other axles or shafts, which improvements are also applicable to axles or shafts, and other like rubbing surfaces.

709. William Tytherleigh. The application of a certain well known process to the covering of iron, in sheets or bars, with copper or copper alloys, whereby he produces a new and useful product.

711. Manning Prentice and Thomas Richardson. Improvements in the manufacture of manures.

713. Manning Prentice and Thomas Richardson. Improvements in the manufacture of manures.

733. Robert Stirling Newall. An improvement in the standing rigging of ships and other vessels.

735. George William Friend. Improvements in umbrellas and parasols.

739. Henry Chapman. An improved electro-mechanical apparatus for supplying and adjusting the electrodes used in the production of the electric light.

743 William Henry Tooth. Certain improvements in the construction of floating vessels, and in the machinery and steam signals connected therewith, and in the application thereof to other purposes.

749. Frederick Joyce. Improvements in the manufacture of percussion caps and other primers.

753. John Crowley. Improvements in the manufacture of malleable cast iron.

761. Charles Goodyear. Improvements in self-inflating pontoons and life-preservers.

765. Herbert Mountford Holmes. Improvements in the manufacture of the tires for wheels.

766. Peter Arrive. Improvements in safety-valves of steam-boilers.

769. William Bennett Hays. An improved breakwater.

787. Alexander Chaplin. Improvements in steam-boilers and in the combustion of fuel.

801. Samuel Holt. Improvements in weaving plush or pile fabrics.

803. Philippe Amédée Devy. Improvements in the construction of coke-ovens. A communication.

813. Alexander Cunninghame. Improvements in the manufacture or production of sulphuric acid and sulphates of iron and alumina.

842. Robert Milligan. An improvement in the manufacture of woven fabrics made of wool, mohair, or alpaca.

844. Charles Crapelet. Improvements in the construction of tompions for cannon and other fire-arms, which improvements are applicable to stopping bottles and other vessels.

866. James Hindle. Improvements in machinery or apparatus used in the process of printing woven fabrics.

874. John Atherton, William Boyes, and William Lancaster. Improvements in temples employed in the manufacture of textile fabrics.

880. Hypolite Macé. Improvements in transferring colours or metals in design, on and from paper and stone on to surfaces. A communication from L. A. C. Macé, of Paris.

888. Alfred Vincent Newton. Improved machinery for manufacturing bolts and other like articles. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed May 4, 1855.

2202. Louisa Monzani.
2203. Louisa Monzani.
2337. George Lee Baxter.
2373. Paul Pretsch.
2413. Pierre Joseph Meeus.
2418. Richard Archibald Brooman.
2441. Charles Asprey.
2455. Nicholas Callan.
2571. James Edward M'Connell.

1855.

273. Thomas Barnabas Daft.

Sealed May 8, 1855.

2363. William Stead, William Spence, and Samuel Wood.
2379. John Berry, Richard Berry, Thomas Berry, and Thomas Royds.
2392. Henry Witthoff.
2402. Joseph Armstrong.
2466. John Henry Johnson.
2497. Peter Armand Lecomte de Fontainemoreau.
2538. James Biden.
2564. Albinus Martin.
2776. James Langridge and Richard Langridge.
2741. John Gray.

1855.

320. Auguste Edouard Loradoux Bellford.
455. Andrew Small.
484. William Johnson.
514. Thomas Walker.
515. Antoine François Jean Claudet.
550. James Hulls and John Lowe.
562. Alfred Vincent Newton.
577. Charles Goodyear, junior.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

Mécanicien.—We cannot, as we stated last week, re-open the discussion on the "Indicated Horse-power of Steam Engines."

N. C. J., Limerick.—Dr. Ure, in his "Dictionary of Arts," says, "The method of trial best adapted to show the real inherent strength and goodness of gunpowder, appears to be an eight or ten-inch iron or brass mortar, with a truly spherical solid shot, having not more than one-tenth of an inch windage, and fired with a low charge. The eight-inch mortar, fired with two ounces of powder, is one of the established methods of proof at Her Majesty's Works. Gunpowders that range equally in this mode of trial may be depended on as being equally strong.

"Another proof is by four drachms of powder laid in a small neat heap, on a clean, polished, copper plate; which heap is fired at the apex by red-hot iron. The explosion should be sharp and quick; not tardy, or lingering; it should produce a sudden concussion in the air; and the force and power of that concussion ought to be judged of by comparison with that produced by powder of known good quality. No sparks should fly off, nor should beads or globules of alkaline residium be left on the copper. If the copper be left clean, *i. e.* without gross foulness, and no light, *i. e.* sparks be seen, the ingredients may be considered to have been carefully prepared, and the powder to have been well manipulated, particularly if pressed and glazed; but if the contrary be the result, there has been a want of skill or of carefulness manifested in the manufacture."

CONTENTS OF THIS NUMBER.

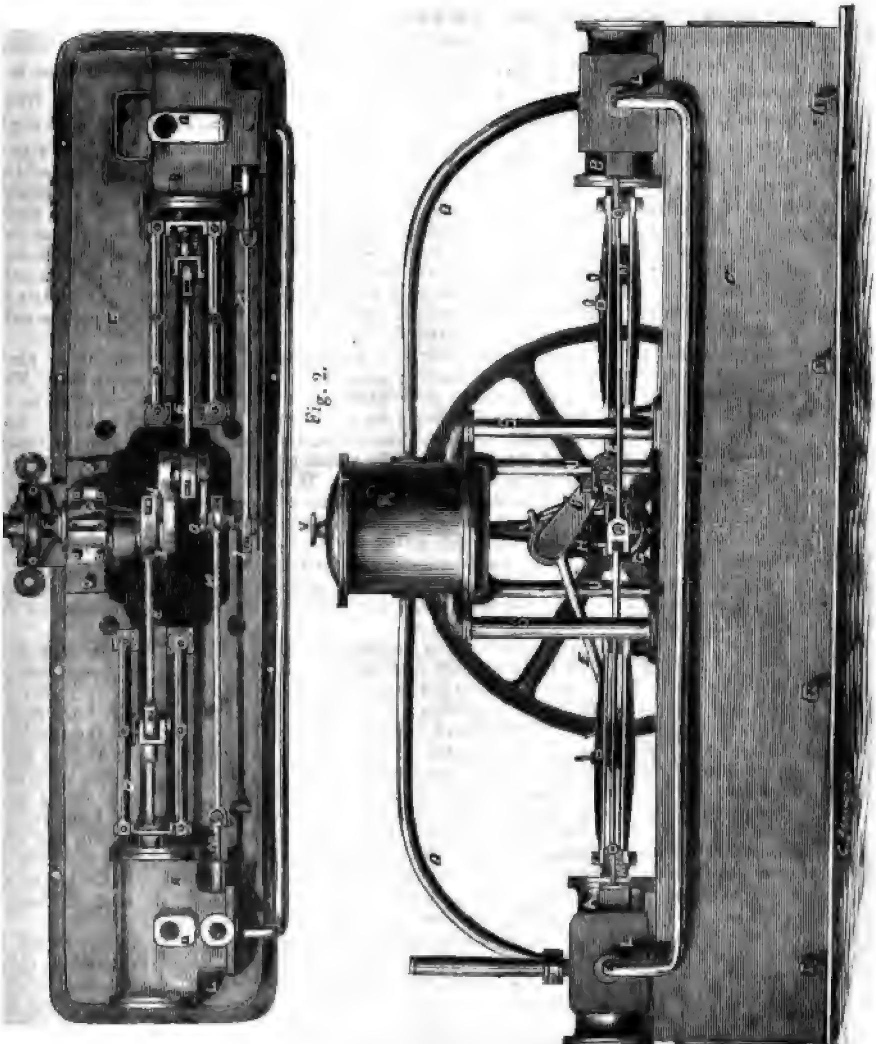
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne Paris; Mason and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1658.] SATURDAY, MAY 19, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

HACKWORTH'S PATENT STEAM ENGINE CRANKS, CYLINDERS, GOVERNORS, AND GEARING.



HACKWORTH'S PATENT STEAM ENGINE CRANKS, CYLINDERS, GOVERNORS, AND GEARING.

(Patent dated September 9, 1854.)

MR. J. W. HACKWORTH, of Priestgate Engine-works, Darlington, patented, at the above date, various modifications of the general details of steam engines, especially intended for stationary and marine purposes, with the view of securing superior efficiency of working action. One of these improvements relates to a "duplex over-end crank," to be used instead of the ordinary crank arrangements of steam engines. This double crank is made by keying or forging on the end of the main shaft a plain crank arm of the usual kind. The opposite end of this crank is formed with an eye to receive a stout crank pin (answering as the working pin for one steam cylinder), which is forged in one piece with a second arm or lighter crank lever. The other end of this secondary arm has forged upon it a second crank pin for the other steam cylinder. The stouter pin of the secondary crank arm is fixed into the eye of the first crank, so as to set the two arms at a considerable angle with each other, or at a right angle, as may be desired. The slide valve for each steam cylinder of a pair of engines may be worked from a spanner keyed on the end of the secondary crank pin; the other end of this spanner being directed back as far as the centre of the shaft, whilst it terminates in a solid pin set true with the axial line of the main shaft, upon which two eccentrics may be placed for working the steam slides; or instead of two eccentrics two pins may be used. The steam cylinders for actuating the "duplex over-end crank" are disposed one on each side of the main shaft, opposite to each other, and nearly in the same straight line. The axial lines of the two cylinders must vary sufficiently to allow for the thickness of the second crank, in addition to one-half of each crank journal; but by cranking the second crank lever this distance may be diminished.

To economise steam power, the working steam cylinder has round it a casing or shell filled with an annular series of tubes running parallel with the cylinder's axial line. The waste steam passes into this chamber from each side of the slide valve chest, so as to surround the contained tubes, provision being made for the exit of the water current. The feed water for the boiler is passed through these tubes, and thus whilst the belt of steam prevents undue radiation of the heat from the steam cylinder, the feed water is highly heated with what would otherwise be mere waste heat. In its application to a vertical steam cylinder, the advantages of this system are thought to come out more prominently. In this case, the tubes being vertical, sediment cannot lodge in them, and the passage of the water upwards obviously best suits the action of the heat. In horizontal engines, the chamber for the reception of the exhaust steam may be arranged with cross tubes.

The necessary governing action for the rate of steam engines is obtained from the buoyant effect of a fluid, as mercury, in one direction, and the weight of a piston in the opposite direction, as is described further on.

In engines where frequent reversing is necessary, in mine engines, for instance, a contrivance is added whereby the necessary reverse movement is obtained without reversing the engine itself. In this arrangement the engine shaft is disposed at right angles with the winding or second motion shaft; the latter has upon its projecting end a large bevil wheel. The engine shaft carries two loose bevil pinions, contrived to gear with the intermediate bevil wheel at pleasure. A cone clutch or friction box is placed on the engine shaft between the two pinions, so as to put the proper pinion into action at pleasure. Various arrangements of clutch or connecting movements may be adopted. A similar result may be obtained by the aid of a combination of four spur pinions and a spur wheel, the engine shaft being disposed in a line parallel with the winding or reverse action shaft, and also parallel with a third or counter shaft. Thus, by shifting the clutch either to one side or other, either a pinion on the engine shaft may be made to gear directly with the wheel on the winding shaft, or the other pinion on the engine shaft may drive the counter shaft, a pinion on the latter shaft driving the winding shaft in a reverse direction.

Fig. 1 of the engravings on the preceding page is a plan, and fig. 2 is a side elevation, of a combined or compound arrangement of steam engines, showing two steam cylinders, lying horizontally, and connected to a duplex over-end crank, as constructed according to this invention. These two figures also comprehend a modification of the steam-condensing and water-heating apparatus, as adapted to this arrangement of engine. A, B are the two steam cylinders employed, these being bolted down at opposite ends of a long cast-iron bed frame

or casing, C. The piston rod ends are fitted with slide blocks to slide in the horizontal guides, D, bolted down to the bed frame, C, and each piston rod is jointed to a connecting rod, E, which passes to a crank pin carried by the main shaft, F. The shaft, F, lies horizontally and at right angles to the axial lines of the steam cylinders A, B, and its end is supported in the pedestal bearings, G, bolted down upon the bed frame, C. The shaft, F, has keyed or forged upon the end projecting inside the bearings, G, a plain crank arm, H, the outer end of which is formed with an eye, to receive a stout crank pin, I, answering as the working pin of the steam cylinder, A, and having strapped or otherwise jointed to it

Fig. 3.

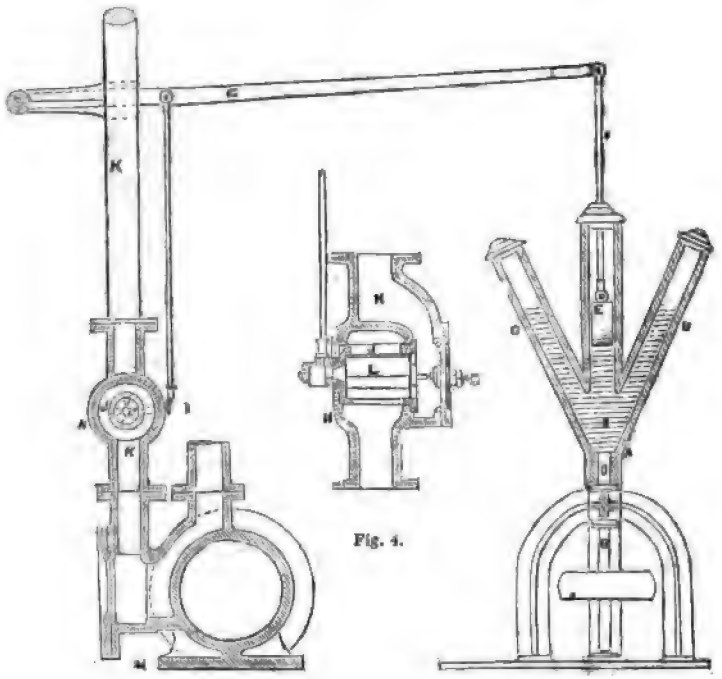


Fig. 4.

the connecting rod, E, of that cylinder. This pin, I, is forged in one piece with a second arm or crank lever, J, the other end of which has forged upon it a second crank pin, K, for the other steam cylinder, B, and having the connecting rod, E, of that cylinder strapped or otherwise jointed to it. The first pin, I, of the crank, J, is set in the arm of the crank, H, in such manner as to place the second crank pin, K, at a distance from the other, equivalent to a quarter of a revolution, or any other distance that may be desirable. The two steam cylinders are placed a little out of line with each other, so that the axial line of each may be in the same plane with the centre of its respective crank pin. The intermediate crank, J, may be cranked or bent, so as to bring the two crank pins nearer together. The valve casings, L, of the steam cylinders are on the sides furthest from the main shaft, and the valve rods, M, pass out through stuffing boxes on the inner ends of the valve casings. Connecting rods, N, are jointed to the valve rods, and are worked by means of a spanner or light lever, O, keyed on the second crank pin, K, and formed with pins, P, placed in suitable positions as regards the axial line of the main shaft for working the valves, the connecting rods, N, being strapped or jointed to them for that purpose; or, instead of this arrangement, the spanner, O, may be formed with a single pin, the centre of which is made to coincide with the axial line of the main shaft, the valves being in this case worked by eccentrics keyed upon this central pin. In single cylinder engines the same general arrangement of details may be employed, the valves being worked by a pin or eccentric on a spanner or return crank fixed upon the main over-end crank pin. It is also obvious that

the steam cylinder or cylinders may be disposed either horizontally or vertically, or in any convenient position. In the arrangement shown in figs. 1 and 2 the cylinder-warming contrivance is dispensed with, the exhaust steam being conveyed by the pipes, Q, to a vessel, R, supported upon four hollow pillars, S. This vessel, R, contains a number of vertical tubes, communicating with spaces, T, at the top and bottom of the vessel, through which tubes the feed water is pumped on its way to the boiler, entering beneath by the pipes, U, and passing off above by the pipe, V, and is thus heated by the feed water.

The governing mechanism is represented in figs. 3 and 4. It consists of a three-branched vessel or pipe, A, carried upon a vertical spindle, B, supported and driven in the manner usually employed with ordinary ball or pendulum governors. One, C, of the three branches of the vessel, A, rises up centrally and vertically, whilst the two other branches, D, run out upwards and laterally on opposite sides. The central branch, C, is bored out cylindrically, and inside it works a plunger or heavy float, E. A rod, F, passes up from the float, E, through a hole in the cover of the pipe, C, and is jointed to the lever, G, which transmits the regulating action of the governor to the throttle valve, H. A quantity of mercury, I, or other suitable fluid is placed in the vessel, A, and fills the three branches to the same level when the governor is at rest. On the governor being caused to revolve, however, the centrifugal action causes the fluid to run up the lateral branches, D, and to sink to a lower level in the central branch, C. If the governor is driven beyond the proper rate, the mercury will sink so low in the central branch, C, as to allow the float, E, to descend, which movement will act on the throttle valve connections in such a manner as to partially close the valve, and diminish the supply of steam to the engine. On the contrary, when the governor revolves at too low a rate, the mercury will sink in the lateral branches, D, and rise correspondingly in the central branch, C, lifting the float, E, and thereby causing the throttle valve to open further, and give an increased supply of steam to the engine to enable it to recover its rate.

The throttle valve, H, represented as in connection with the improved governor, is also constructed according to one portion of this invention. The valve seating consists of a cylinder, J, fitted into the steam-pipe, K, in such manner that one of the pipe communicates with one or both ends of the cylindrical seating, whilst the other end communicates with the circumference of the seating, the steam having to pass through the cylindrical valve seating on its way to the cylinder, this passage being effected through slots in the seating. The spindle, L, of the valve passes through the axis of the seating, and carries a number of radial feathers corresponding to the slots in the valve seating, J, and turned on their circumferential edges to work upon the turned inside surface of the valve seating. The valve is thus balanced as regards the steam pressure, which can in no position have any tendency to shut or open it, or prevent its being shut or opened by the least possible force applied to its lever.

ON THE MANUFACTURE OF STEEL.

A paper on the manufacture of steel, as carried on in different countries, was read on Wednesday evening, May 9, at the Society of Arts, by Mr. Charles Sanderson. After alluding to the antiquity of the manufacture, the composition of steel, and the raw materials from which it is prepared, the author proceeded as follows:

The kinds of steel which are manufactured are natural steel, called raw steel, or German steel; Paal steel, produced in Styria, by a peculiar method; cemented, or converted steel; cast-steel, obtained by melting cemented steel; puddled steel, obtained by puddling pig iron in a peculiar way.

Natural, or German steel, is so called because it is produced direct from pig iron, the result of the fusion of the spathose iron ores alone, or in a small degree mixed with the brown oxide; these ores produce a *highly* crystalline metal, called *spiegel eisen*, that is, looking-glass iron, on account of the very large crystals the metal presents. This crude iron contains about four per cent. of carbon, and four to five per cent. of manganese. Karsten, Hassenfratz, Marcher, and Reamur, all advocate the use of grey pig iron for the production of steel; indeed they state distinctly that first quality steel *cannot* be produced without it; that the object is to clear away all foreign matter by working it in the furnace, to retain the carbon, and to combine it with the iron. This theory I hold to be incorrect, although supported by such high authorities. Grey iron contains the maximum quantity of carbon, and consequently remains for a longer time in a state of fluidity than iron containing less carbon; the metal is then mixed up, not only with the foreign matter it may itself contain, but also with that with which it may become mixed in the furnace in which it is worked. This pro-

longed working, which is necessary to bring highly carbonised iron into a malleable state, increases the tendency to produce silicates of iron, which entering into composition with the steel during its production, renders it red short. Again, by this lengthened process, the metal becomes very tender and open in its grain; the molecules of silicate of iron which are produced will not unite with the true metallic part; and also, whenever the molecular construction of iron or steel is destroyed by excessive heat, it becomes unmalleable. Both these are the causes of red shortness, and also of the want of strength when cold. For these reasons I consider that grey pig iron is by no means the best for producing natural steel; and for the same reasons I should not recommend the highly carbonised white iron, although it is now used both in Germany and in France. In Austria, however, they have improved upon the general continental process; their pig iron is often highly carbonised, but they tap the metal from the blast furnace into a round hole, and throwing a little water on the surface, they thus chill a small cake about half an inch; this is taken from the surface, and the same operation is performed until the whole is formed into cakes; these cakes are then piled edgewise in a furnace, are covered with charcoal, and heated for 48 hours; by this process the *carbon* is very much discharged. By using these cakes in the refining, the steel is sooner made, and is of better quality. In the opinions I have given to many German steel makers, and in the advice I have offered them, I have endeavoured to show that pig iron can only be freed from its impurities whilst in a fluid state. I take the advantage of the property of cast-iron, and previous to melting it in the steel refinery I submit it to a purification, by which process I seek to *reduce* the degree of carbonisation of the metal, and to separate and dissolve the earthy matter with which it may be combined; I then obtain a purer metal for the production of steel. The metal itself being to some extent decarbonised, is sooner brought into "nature," as it is termed; that is, it sooner becomes steel. The process being shorter, and the metal itself being purer, there is less chance or opportunity for the formation of deleterious compounds, which, becoming incorporated with the steel, seriously injure its quality. Of course, steel manufactured from crude iron, either purified or not, of any defined quality, will inherit such quality, be it good or bad. Art can in some degree remove these noxious qualities from the crude iron. Chemistry has lent its powerful assistance, yet nature will maintain her sway, and in all cases the good or bad qualities of the metal will be transmitted to the steel.

The furnaces in which raw or natural steel is manufactured are nearly the same, as far as regards their general construction, in all countries where such steel is produced; yet

Fig. 1.

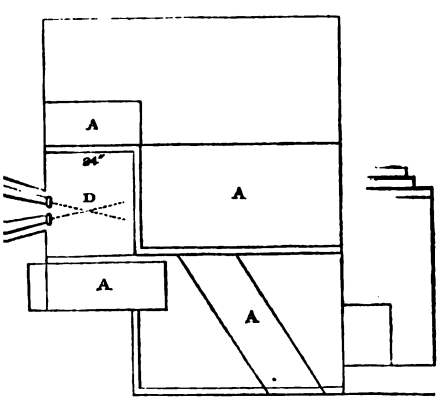
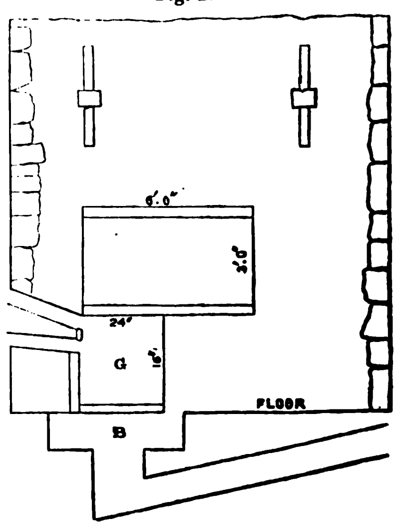


Fig. 2.



each country, or even district, has the fire in which the metal is worked differently constructed. We find, therefore, the German, the Styrian, the Carinthian, and many other

methods, all producing steel from pig iron, yet pursuing different modes of operation. These differences arise from the nature of the pig the country produces, and the peculiar habits of the workmen. These modified processes do not affect the theory of the manufacture, but they rather accommodate themselves to the peculiar character of the metal produced in the vicinity. In Siegen they use the white carbonised, manganesian metal, while in Austria a grey or mottled pig iron is used.

The furnace is built in the same form as a common charcoal refinery.

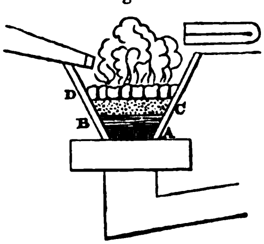
Fig. 1 shows a ground-plan of the furnace; fig. 2 an elevation; and fig. 3 the form of the fire itself and the position of the metal within it. The fire, D, is 24 inches long and 24 inches wide; A, A, A are metal plates surrounding the furnace.

Fig. 2 shows the elevation, usually built of stone, and braced with iron bars. The fire, G, is 16 inches deep and 24 inches wide. Before the tuyere at B, a space is left under the fire, to allow the damp to escape, and thus keep the bottom dry and hot.

In fig. 1 there are two tuyeres, but only one tuyere-iron which receives both the blast nozzles, which are so laid and directed that the currents of air cross each other, as shown by the dotted lines; the blast is kept as regular as possible, so that the fire may be of one uniform heat, whatever intensity may be required.

Fig. 3 shows the fire itself, with the metal, charcoal, and blast. A is a bottom of char-

Fig. 3.



coal, rammed down very close and hard. B is another bottom, but not so closely beaten down; this bed of charcoal protects the under one, and serves also to give out carbon to the loop of steel during its production. C is a thin stratum of metal, which is kept in the fire to surround the loop. D shows the loop itself in progress.

When the fire is hot, the first operation is to melt down a portion of pig iron, say 50 to 70 pounds, according as the pig contains *more or less* carbon; the charcoal is then *pushed back* from the upper part of the fire, and the blast, which is then reduced, is allowed to play upon the surface of the metal, adding from time to time some hammer slack, or rich cinder, the result of the previous loop. All these operations tend to *decarbonise* the metal to a certain extent; the mass begins to thicken, and at length becomes solid. The workman then draws together the charcoal and melts down another portion of metal upon the cake. This operation renders the face of the cake again fluid, but the operation of decarbonisation being repeated in the second charge, it also thickens, incorporates itself with the previous cake, and the whole become hard; metal is again added until the loop is completed. During these successive operations the loop is never raised before the blast, as it is in making iron, but it is drawn from the fire and hammered into a large bloom, which is cut into several pieces, the ends being kept separated from the middle or more solid parts, which are the best.

This operation, apparently so simple in itself, requires both skill and care. The workman has to judge, as the operation proceeds, of the amount of carbon which he has retained from the pig iron; if too much, the result is a very raw, crude, untreatable steel; if too little, he obtains only a steelified iron. He has also to keep the cinder at a proper degree of fluidity, which is modified from time to time by the addition of quartz, old slags, &c. It is usual to keep from two to three inches of cinder on the face of the metal, to protect it from the direct action of the blast. The fire itself is formed of iron plates, and the two charcoal bottoms rise to within nine inches of the tuyere, which is laid flatter than when iron is being made. The position of the tuyere causes the fire to work more slowly, but it insures a better result.

The quantity of blast required is about 180 cubic feet per minute, at a pressure of 17 inches water gauge. Good workmen make 7 cwt. of steel in 17 hours. The waste of the pig iron is from 20 to 25 per cent., and the quantity of charcoal consumed is 240 bushels per ton. The inclination of the tuyere is 12 to 15 degrees. The flame of the fire is the best guide for the workman. During its working it should be a red blueish colour. When it becomes white the fire is working too hot.

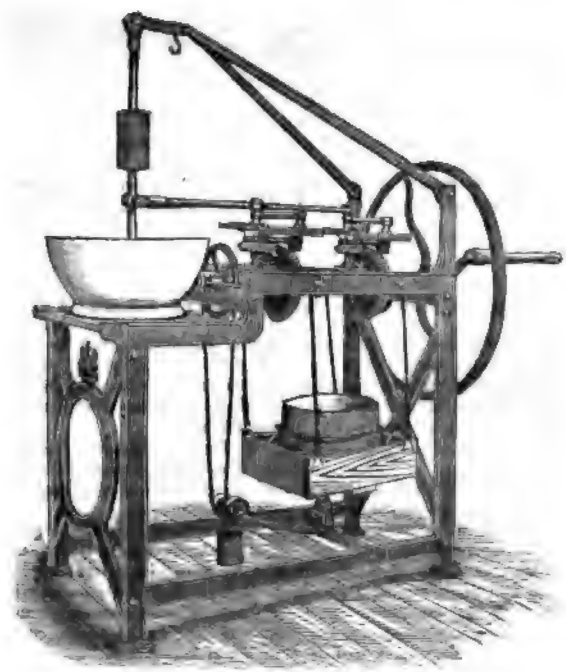
(To be continued.)

GOODALL'S PATENT GRINDING AND LEVIGATING APPARATUS.

MR. H. GOODALL, chemist, of Derby, has recently patented a very useful grinding-

machine, to the merits of which very high testimony has, in several cases, been borne. His invention consists in the construction and arrangement of an apparatus by which the operations of grinding or levigating various substances may be performed by the aid of a pestle, instead of rollers, or flat grinding surfaces. The accompanying engraving represents the machine.

The substances to be operated upon are placed in the mortar, in which the pestle is made to work by mechanical means in such manner as to give the same rubbing motion as is imparted by the hand, when substances



are ground or pulverized in a mortar by manual labour. The pestle may be weighted to any desired extent, and by traversing over a different surface every time, removes the necessity of scrapers to keep the materials constantly acted upon.

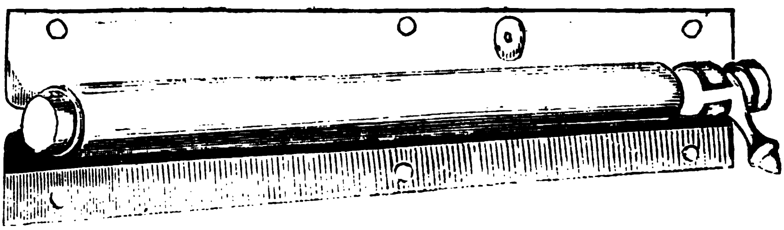
The amount of labour saved is considerable, and the hardest and most difficult substances may be ground by this machine, worked by hand, as effectually as by the most powerful machinery, enabling druggists and others to grind articles perfectly, on a small scale, which could only be done hitherto by mills requiring great power to drive them. On a large scale, driven by steam, it will be found to be a very economical and effective machine.

The mortar and pestle are both detached, and may be easily removed: the mortar being placed in front of the machinery, the possibility of dirt falling into it from the friction of the wheels is avoided; hence it will be found of great advantage for all kinds of salts, choice colours, mercurial preparations, printer's-ink, paints, &c. A sifting-apparatus, if required, can be added to the machine, so that the operation of powdering and sifting may be carried on at the same time.

NEW PATENT BARREL-BOLT.

A new barrel-bolt has recently been patented by John Phillips, and is manufactured by the Patent Bolt and Latch Company, Birmingham. It differs from the common bolt (made principally at Willenhall, in Staffordshire) in its being made

without a single rivet. The barrel is pressed to the form of the bolt itself from the plate, by which means the whole is made from one piece of metal. Much greater strength is secured than by the riveted bolt, and it is not requisite to cut away the wood for fixing the bolt.



The accompanying engraving represents the improved bolt.

PREMIUM FOR THE PREVENTION OF SMOKE.

THE Steam-Coal Collieries' Association at Newcastle-upon-Tyne have offered a reward of *five hundred pounds* for the invention of an effectual method for preventing the emission of smoke from the chimneys of multitubular boilers upon the following conditions:

1. The Steam-Coal Collieries' Association will appoint three persons as judges, to whom shall be referred all designs which may be sent in for competition, and the award of these judges, or of the majority of them, shall be final and decisive.

2. Every competitor for the above premium shall, at his own expense, prepare sufficient models or drawings, and a full written description of the system he proposes to adopt, and shall forward the same to the Secretary, at the Coal Trade-office, Newcastle-upon-Tyne, on or before the 1st of August, 1855.

3. The judges shall select such one or more of the designs so sent in as they may think most applicable, and submit the same to such practical trials as they may deem proper, to ascertain their actual and relative value.

4. For this purpose, an additional sum, not exceeding £300, will be placed by the Association at the disposal of the judges.

5. Any competitor may, nevertheless, if he think fit, at his own expense, require his invention to be submitted to practical trial; and the same shall be examined and reported upon by the judges in the same manner as though it had been selected by them as aforesaid. And in case such trial should establish, in the opinion of the judges, the superiority of the invention over the others, and its conformity with the conditions hereinafter stipulated, then the inventor shall be allowed, in addition to the premium, such further reasonable sum as the judges may award to him, on account of the expenses of the trials.

6. The premium shall be paid over to the inventor of the design which, in the opinion of the majority of the judges, shall be entitled thereto.

7. No design shall be deemed entitled to the premium, unless it be in conformity with the following conditions:

(a.) It shall effectually prevent the production of smoke during the combustion of any of the Hartley steam coals of the north of England.

(b.) Such prevention shall be accomplished by the combustion of the smoke or gases in the furnace or air-chamber previous to passing through the flues or tubes.

(c.) It shall be applicable to all the usual forms of boilers, containing a number of small tubes between the furnace and the chimney, and especially to the usual forms of marine boilers.

(d.) It shall not diminish the evaporating power of the boiler to which it may be applied.

(e.) It shall not impair the durability of the boiler.

(f.) It shall, as far as possible, be independent of the personal attention of stoker or engineer; but it is not essential that it should be absolutely so.

(g.) It shall not be, or be made the subject of a patent, or if so, the inventor or patentee shall undertake that the patent right shall not exceed in amount such rate per horse power, or per foot of fire grate, as the judges shall determine.

HUNT'S "ELEMENTARY PHYSICS." *

(SECOND NOTICE.)

"*Il n'en coûte aucune peine de lire ce qui est bon,*" says Voltaire. Reading is certainly a pleasant occupation, when it is, as Bacon says, "conversing with the wise." But it is quite otherwise when one is called on to peruse a book like that under review. It is better, however, that we should undertake to read and report upon it, than that it should be the means of absorbing the time and money of those for whom it pretends to be written, and, in return, unsettle their faith in nature, and render those studies, which might afford profit and instruction, sources of weariness and disgust. We, therefore, return to our task.

The third chapter treats of the "Laws of slightly elastic fluids." By these fluids our author means those which are generally denominated non-elastic; that is, liquids. Mr. Hunt has here shown a desire to be original in rather an unseasonable way. There is a much wider distinction between a liquid and a gas than between the terms "slightly elastic" and "elastic." It is true that water and other liquids possess some degree of that quality which is possessed by all material substances, called elasticity. But it is not true that water possesses any degree of that quality which is the characteristic of gaseous bodies, also called elasticity. To term water a slightly-elastic fluid, is to ignore the fact that the elasticity of an elastic fluid is understood to be a quality belonging in no degree to any other class of bodies; while the elasticity possessed by liquids is, in different degrees, the property of all forms of matter. This appears the more pedantic when we observe that all the laws which the author attempts to state are drawn from the supposition that these fluids are not only non-elastic, but also incompressible.

This chapter is divided into two parts,—Hydrostatics, and Hydraulics. The first part is composed of an attempt to state and illustrate the law of the distribution of fluid pressure. The following extracts will exhibit the style of the whole:

"All fluids in a state of complete repose present horizontality; that is, every part of their surfaces is equidistant from the centre of the earth, every atom being equally acted on by gravitation, and free to arrange itself in obedience to that influence."

* * * "All non-elastic bodies possess the property of transmitting equally in all directions the pressure exerted on any point of their surfaces." What *can* this mean?

Here is a passage not commendable for accuracy:

"For the purpose of ascertaining the pressure exerted upon any sloping wall, or on the sides of a pond, drop a line from the water to the middle point between the water's edge and the deepest part, and multiply the length of the plumbline under water by the extent of the side covered with water." Of course, nobody will ever attempt to follow such a rule as that. On the same page we find this sapient remark:

"The resistance offered when we attempt to sink a body lighter than water in that fluid, proves that it presses with equal force upwards as downwards. Upon this depend the laws of floating bodies; and the bottoms of large ships, on this account, have to be built very strong."

From the hydraulics we will quote one of many faulty passages. Speaking of Barker's mill, the author says: "The moving force becomes greater after the machine has begun to revolve, the water in the horizontal arms acquiring a centrifugal force, by which its pressure against the side is increased." We should like to see Mr. Hunt prove this. It is boldly stated, and ought therefore to be well grounded. We have always thought that the moving force is greatest when the mill is at rest, and that as its velocity increases, this force decreases; and that such a velocity might be communicated to the mill, by independent means, as to cause the said moving force to vanish altogether. As to the centrifugal force augmenting the motive power of the machine, this is to us a notion worthy of the seekers after perpetual motion. Of course, whatever rotary motion the fluid acquires absorbs so much of the motive power, so that no gain can arise in that way. We shall not, however, enter more deeply into this question here; but pass to the next chapter, on the "Laws of elastic fluids."

The first thing we meet with in this chapter is a homily about twilight, and the refraction of the sun's rays by the atmosphere. This is altogether misplaced, to say nothing about its inherent absurdity. What has twilight to do with the laws of elastic fluids? Mr. Hunt seems to imagine that a mode of discovering the height of the atmosphere from the length of twilight can be shown by such collections of jumbled words as this: "Our twilight is owing to the refraction or bending of the rays of the sun,—after that orb has sunk below the horizon,—by the medium through which they pass; therefore the duration of the twilight affords a guide to the height of the atmosphere." The only end this can serve

* We find it is necessary to state that the italics which occur in the extracts from this work in our last week's notice were not employed for purposes of criticism, but appear in the original. —ED. M. M.

is to mystify any unfortunate reader who may not feel justified in condemning what is taught by a member of the Royal Society. Mr. Hunt has not defined twilight, or, doubtless, his definition would have been worthy of transcription; for he does not seem to know what twilight is. Let Mr. Hunt reconsider this matter, and he will find that twilight is less purely the effect of refraction than he seems to believe. Twilight properly does not commence till sunset, and the sun does not set till its rays (refracted or not) cease to convey its image to us. In fact, twilight arises rather from the dispersing than the refracting powers of the atmosphere. Finally, no confidence can be placed in the estimate of the height of the atmosphere made in this way, because it is very little better than mere guess work.

Pursuing this subject still further, Mr. Hunt betrays to us how very little aptitude he possesses for understanding the actual laws and conditions of the atmosphere; he says (pages 136, 137), "It would appear that the gaseous fluid is held to the solid earth by virtue of the same, or a similar, power to that which, we have already shown, is to be detected in action over the surfaces of all bodies. This has not, however, been a point which has hitherto engaged attention; — gravitation alone has been thought sufficient to explain the phenomenon. By ascending mountains and floating at considerable elevations in balloons, it has been determined that as this attraction diminishes, the air becomes more thin; not because it is rarefied by heat, but, according to one view, because the pressure of the superincumbent column is lessened. At the same time this attraction of particles is reduced, and, the air rapidly losing its capacity for heat, cold, regularly increasing with the height, is produced. It has been thought that this loss of heat would eventually place a limit to rarefaction, and even reduce the uppermost stratum of the air to a liquid state."

This passage is contradicted in one which occurs in the chapter on Heat; a fact which shows how little the author understands the relations which the various parts of his subject bear to one another. On the same page we have "the flowing currents of the air," spoken of as proving "its *attenuated fluidity*." And on the next page there is an attempt to prove what neither needs nor admits of any proof—the impenetrability of the air. Impenetrability forms the principal part of our idea of matter, and is seen to be necessary to that idea. That this quality belongs to all material substances is, in fact, an axiom, and is no more provable than those of *Euclid's* geometry.

On page 155, we have a further exhibition of our author's *penchant* for torturing the adjective *attenuated*; he has here forced it into the phrase "*attenuated regions* of the air."

It could not be expected, after what we have witnessed, that any very clear account of the trade winds would be found in the book; such as it is, we give it as a favourable specimen of Mr. Hunt's style. "Their origin is due to the powerful heat of the torrid zone, which rarefies the air of that region. The air thus rarefied rises, and to supply its place, the colder air of the temperate zones moves towards the equator. However, these north and south winds from regions where the rotatory motion of the earth's surface is less, to those where it is greatest. If the earth did not turn round, they would be north and south winds; but as they approach the equatorial region they acquire additional velocity, and are bent into north-east and south-east winds."

This passage will not prove very transparent to any kind of reader; but we must pass on to the next chapter on the "Sonorous Movement of Bodies." From this we will extract just one paragraph, to show its fellowship with the rest of the book. The subject is the waves of the ocean.

"The importance of these undulations of water is very great. Did not the great ocean, by the mobility of its particles, yield to every disturbance, it would soon be rendered putrid; but these disturbances present the organic exuviæ which the sea contains to the action of active chemical agencies, and thus putrescence is prevented. The influences at work on the ocean are, the attraction of the sun and moon, producing the great tidal wave; the rotation of the earth on her axis, which gives rise to a constant easterly current; the action of heat commencing those great ocean currents which flow from the warmer to the colder portions of the earth; and the winds, which, in their calmest movements, merely ripple the surface, but which, in their more violent actions, stir the ocean to a very considerable depth!"

With regard to this, several questions present themselves.

1. What has all this to do with acoustics?

2. What have the tidal wave and the ocean currents to do with the importance of undulations in any sense?

3. How can the rotation of the earth of itself give rise to "a constant *easterly* current?"

4. Does not the action of heat (by producing evaporation) give rise to currents from cold to warm, rather than from warm to cold climates?

We pass to the next chapter, which concerns Electricity and Magnetism. Even here

our author has not been able to avoid his habit of making tangible blunders, although so little is known of the nature of the agencies, that he might speculate a great deal without invading known principles to any great extent. Mr. Hunt deems it of paramount importance, that the public should know to which of the several hypotheses regarding electricity he lends his sanction and support. He says, Dr. Faraday "is rather disposed to regard this agency as 'a mere power of matter, like what we conceive of the power of gravitation.' It is not easy to make this view clearly intelligible to such as have not been accustomed to metaphysical studies." This from Mr. Hunt! His solecisms are probably due to the intricacies of his metaphysical studies. Referring to the Franklinian theory, and that of Fay and Symmer, he continues: "Either of the preceding hypotheses—of two electricities, or of one—may be adopted in connection with the views of this philosopher (Faraday); it will, however, be evident to all, that I am not disposed to entertain this view, but rather to consider, with Franklin, that electricity has a positive entity; that it is a subtle body condensed on the surfaces, and through the pores of all bodies, in virtue of some of the forces of matter, which have been already considered." We think that if such countenance can have any influence on this hypothesis, it will be a damaging one. We shall not occupy much of the reader's attention with erroneous notions of magnetism; we will however quote the following laws, ascribed by Mr. Hunt to Hausteen, because they are not unamusing.

"1. The attractive and repulsive force with which two magnetic particles affect each other, is always directly as their intensities, and inversely as the squares of their mutual distances.

"2. The absolute intensity of any magnetic particle situated in the axis is proportional to the square of its distance from the middle point of the axis.

"3. The distance from the middle of a magnet being the same, the force opposite the poles, or in the direction of the axis, is double of the force in the magnetic equator.

"In all cases the south pole of a magnet will be found to be weaker than the north pole." To Mr. Hunt, and to him alone, belongs this code of magnetic laws; he has set his mark upon them; to ascribe them to any one else is to do himself injustice, and to outrage the person he pretends to honour. Who else would like to talk of the *intensity of a particle?* or of a *force opposite the poles of a magnet?* &c. Again; that the two poles of a magnet are not equal in power is contrary to Faraday's views of the same subject.

In the chapter on Heat, Mr. Hunt is as original and as erroneous as elsewhere. What, for instance, does this paragraph mean?

"Heat is a universal force, moving according to laws which are peculiarly its own, although in some respects they approach nearly to those which regulate the motions of light. Calorific radiations are capable of being reflected, and undergo polarization under the same circumstances as do the luminous rays."

Here, be it observed, the polarization of light has not yet been explained, nor any attempt made to explain it. This paragraph, like the rest, has its internal arrangements on a par with that of the paragraphs in the chapters, and the chapters in the book. Here are wonderful definitions of latent and sensible heat:

"We speak of free caloric, and mean thereby the circumstance of heat being *sensible*, as when diffusing itself, in its tendency towards an equilibrium, through all surrounding bodies. When an equilibrium is restored, and all neighbouring bodies are at an equal temperature, this agency is said to be *latent*, or in a state of repose. The doctrine of *latent*, or hidden heat, has been disputed by those philosophers who are disposed to regard heat as a mere property of matter, its sensible effects being due to motion. When, however, we consider the evidence which experimental science affords us of phenomena, during which caloric appears to be squeezed out of solid or gaseous matter, as the molecules are brought closer together, the hypothesis of latent heat receives the strongest support."

We are first told that free heat is a circumstance, and then that latent heat is the heat resident in a system of bodies of equable temperature. We need make no correction in this place. On page 340 is detailed a false method of graduating a thermometer. Page 347 we have a remarkable evidence of obtuseness: "Place upon a hot plate, side by side, two vessels containing equal weights of water and mercury, at a uniform temperature; if, after a period, we examine the temperature of each, we shall find that the mercury will be much hotter than the water, the capacity of the one for caloric being greater than the other." Such an interpretation to such an experiment is the evidence of a very small power of discrimination in the interpreter. This experiment would prove one of two things, either that mercury is a much better conductor of heat than water, or that the mercury has a *less capacity* for heat than has water. Which of these is, or whether both are, the cause of the difference of temperature, the experiment does not show.

Page 350 we read:

"Water has the greatest capacity for heat of any body, and, consequently, it is a very important agent in equalising the temperature of our planet?"—Has water a greater capacity for heat than steam?

The following about the variation of the temperature of the air as we ascend from the earth's surface, next requires our attention. It is in contradiction to a statement already referred to.

"As the air increases in tenuity, its capacity for heat becomes greater, and hence the extreme degree of cold experienced in ascending to great heights in the atmosphere. Regulated by this, we have a certain line of elevation, above which the snow never melts; this is called the *snow line, or line of perpetual snow.* * * The upper limits of the snow line cannot be ascertained, since we are not able to ascend to such a height as to be beyond the limits of aqueous vapour. Water must, however, cease to exist in the atmosphere at no very great distance from the earth, as evaporation must be suspended by the absence of a sufficient amount of heat."

This mode of accounting for the decrease of temperature in the higher regions of our atmosphere is sufficiently absurd as it is commonly presented to us, but it is here made especially so by the manner in which the author puts it. It will give us very little trouble to exhibit its incorrectness. It is quite true that the diminution of the density of a quantity of air or other elastic fluid involves an increase in its capacity for heat; but an increased capacity for heat does not necessarily imply a decrease of temperature; with a given density and capacity for heat, a mass of atmosphere may have all imaginable temperatures. This being true, as it undoubtedly is, Mr. Hunt's argument is destroyed, and his "*hence*" in the foregoing extract is altogether out of place. To illustrate this further, we may take the ordinary equation connecting the pressure, density, and temperature of elastic fluids;

$$p = k\rho(1+a\theta),$$

where $p =$ the pressure, ρ the density, θ the temperature above the standard, k a constant depending on the nature of the particular gas, and a the increment of volume per degree of temperature. In this equation we see that both p and ρ may diminish without any variation of θ, or with any kind of increase or decrease of the temperature; though with a given pressure and density the temperature can have but one value. Thus with a given series of pairs of values for the pressure and density we can have *but one series* of values for the temperature. *And in the* case of the atmosphere, with the actual mode in which the pressure and density vary, the actual variation of temperature is necessary, and may be deemed accounted for by that mode of variation. But to say either that the pressure or the density decreases, or that the pressure and density both decrease, is not at all to account for the diminution of temperature, as these might both happen with a constant amount of sensible heat in a given weight of the gas. If we transform our equation thus,

$$\theta = \frac{p}{ak\rho} - \frac{1}{a}$$

we perceive that the temperature would remain constant if the pressure and density increased or diminished at the same rate. And in order that θ may grow less, the pressure must diminish faster than the density. So that if we wish to account in this way for the fact that the temperature constantly grows less and less as we ascend on a mountain or in a balloon, we must explain why the pressure and density have their actual mode of variation. We think Mr. Hunt would find this a difficult task; in fact, we do not believe it possible to show this independently of the temperature. The proper way to set to work to solve the problem, seems to us to be to seek out a reason for the depression of temperature independent both of the density and pressure. A few hints will perhaps suffice to convey to the reader a notion of the method which we think should be pursued. Let us imagine the atmosphere to be replaced by an incompressible fluid of a given altitude, having a temperature to begin with, of 60° throughout the whole mass, and suppose this to be at the same time the temperature of the earth's crust. We must conceive the incompressible fluid to have all the properties of air, except its elasticity: it must transmit heat, and treat the sun's rays exactly in the same way as the air does. It is tolerably clear the outer strata of this envelope would part very rapidly with their heat to the space around, until the temperature of the upper stratum approximated to that of that space, and the successive temperatures of the lower strata were so graduated from the top to the bottom, that the heat given off from any particular stratum to the next superior (in consequence of its superiority of temperature), were equal to that parted with by the upper stratum to the outside spaces, and to that given off by the earth below to the lowest stratum of the fluid; and until this constant stream were exactly compensated periodically by the influx of solar and other heat. One of the uses that such an envelope would serve—a use apparently fulfilled by our own atmosphere—is that of preventing the surface of

the earth from assuming the temperature of surrounding space. The only reason why the ordinary surface of the earth is warmer than the tops of the Alps appears to be, that one has a thicker garment than the other. Thus we regard the graduation of the atmospheric temperature as determined by the temperature of the earth on one side, and that of the outer spaces on the other; and accordingly the density must be determined by the pressure and temperature.

From what has been said, it will not be difficult to see how the gradual increase of temperature, above pointed out, may extend even to some distance below the surface of the earth. The fact that the sensible heat does increase below the surface, has led some to think the centre of the earth possesses the heat of an intense fire, though there is not much ground for such a belief. *A propos* to this Mr. Hunt says (page 364), "Every extended series of observations appears to contradict the hypothesis of a *central fire*, and to prove that the increase of subterranean temperature is due to the absorption of calorific matter by the surface, and the gradual conduction of it by the masses of the rocks to a considerable depth." That is, rocks have the peculiar property of conducting heat from the colder to the hotter of two masses. That is very philosophical, certainly.

On page 366, the properties belonging to paraboloidal mirrors alone are ascribed to all concave mirrors. Here is an absurd statement from page 368: "In practice, however, radiation is usually prevented by clothing the pipes thickly with felt, or some other bad conductor of heat." This felt is used to prevent the escape of heat by conduction, and to some extent facilitates radiation. One more specimen, of like merit, from this chapter:

"Bodies radiating heat quickly become sooner heated when exposed to calorific radiation, than those bodies which radiate slowly. Upon this fact is established Prévost's *theory of exchanges*; or, in other words, the extension, to heat, of the theory of the equilibrium of forces, which appears to hold true for every condition of physical phenomena."

The next and last chapter is on "Light and Actinism." On its third page begins a description of the eye, which hardly contains a single true statement. "In the centre of the cornea," says the author, "is a circular opening, the *pupil*, and within it is the crystalline lens, a transparent capsule containing the vitreous humour." This is strange confusion. The pupil is made an opening in the cornea where there is no opening; the aqueous humour, which in fact occupies the space between the cornea and the crystalline lens, is not mentioned; and the vitreous humour, which ought to be placed in the principal chamber of the eye, is crowded into the crystalline lens to the expulsion of the proper tenant, the crystalline humour.

Mr. Hunt gives us, on page 387, a cure for squinting. "The cure of squinting is to be effected by constantly directing the eyes in such a manner that the axes shall coincide." That is, the afflicted party must leave off squinting, and squint no more; a sure cure, we should think, if practicable!

The following seems very little calculated to convey any instruction as to physical science; it will serve to show, however, Mr. Hunt's simplicity in relation to these matters:

"M. Fiseau has determined the velocity of artificial light by a very ingenious contrivance. A disc, carrying a certain number of teeth upon its periphery, was made to revolve at a known rate; placing a tube behind these, and looking at the open spaces between the teeth, they become less evident to sight the greater the velocity of the moving wheel, until, at a certain speed, the whole edge becomes transparent. The rate at which the wheel moves being known, it is easy to determine the time occupied while one tooth passes to take the place of the one next to it. A ray of light is made to traverse many miles through space, and then pass through the teeth of the revolving disc. It moves the whole distance in just the time occupied in the movement of a single tooth to the place of another at a certain speed; this method gives a very close approximation to the results obtained by observation on the moons of Jupiter, or on the aberration of light." Then follows a false definition of aberration:—"By aberration is meant the difference between the real and the apparent places of the stars."

As to M. Fiseau's experiment, *as above described*, we are obliged to deny its efficiency altogether. The apparent transparency of the edge of the wheel arises from the inability of the eye to distinguish between a continuous and an intermittent stream of light when the broken portions of the ray follow each other at very small intervals of time. Now these intervals of time would be the same for the same velocity of the wheel, whatever be the velocity of light, and at whatever distance from the wheel the source of light is placed.

On the next page we have the old error about concave mirrors repeated; and on the following page the law of refraction misstated.

As a last extract, we give the whole of the exposition of the principle of achromatic lenses. We are first told that "the prismatic dispersion in English flint glass is 14

times as great as in crown glass;" and then Mr. Hunt says, "Supposing one of the lenses in figure 204 to be of crown and the other of flint glass, it will be obvious, when two such glasses are combined, that the rays refracted by one prismatic medium will be restored to their original line by the other." In the figure are a double-convex and a double-concave lens. We should be pleased to know any one to whom such a state of things' would "be obvious" from such an explanation.

We have shown our readers that our estimate of this book has good foundation. The extracts we have made are sufficient to prove the work a thorough failure. We repeat that there is hardly anything in the volume which is not either unintelligible or false. It may be Mr. Hunt's opinion, as it is the opinion of many persons we have heard of and met with, that the proper method of popularizing science is, so to disguise its principles by hard words of any and all kinds, that their first discoverers would not recognize them in their new form. Such persons either think that the uneducated *can* comprehend them simply because the initiated *cannot*, or they desire to obtain amongst the ignorant that reputation for great learning which those who talk "high nonsense" sometimes acquire. In the first case the writer deceives himself; in the second he endeavours to deceive his readers. We have tried to provide for either state of things.

We may assure those who desire a work of a popular character, to assist them in the acquirement of scientific knowledge, that useful and good books are not wholly absent from our literature. There are many such, among which we may mention Professor Moseley's "Mechanics applied to the Arts," Dr. Lardner's "Hand Book of Natural Philosophy and Astronomy;" and to these we may add the publications of the Messrs. Chambers, which, though perhaps not without faults, are in very many respects excellent. The perusal of Mr. Hunt's work, on the contrary, cannot but prove worse than unprofitable to every class of readers; for those who have not independent means of testing his statements may imbibe his errors; and those who possess these means will not be rewarded for their trouble, because his mistakes constitute his sole originality.

THE CRIMEAN SUBMARINE TELEGRAPH.

To the Editor of the Mechanics' Magazine.

SIR,—There appears to be a great deal of mystery and not a little incongruity in the various statements that have, from time to time, been put forth respecting the Crimean Submarine Telegraph, and we are really left very much in the dark on the subject of its construction and efficiency.

The difficulties experienced by those who attempt to comprehend the matter will be seen from the following summary of what has hitherto appeared in print, apparently authoritatively. In January last it was announced in the papers, with a great flourish of trumpets, that the dispatch with which the protected wires had been prepared was something quite wonderful, and "strikingly illustrative of the energy of the British character," and details were given as to the important personages who were to proceed to the Black Sea to lay it down, and the number of *employés* (60) who accompanied it. It was likewise stated the telegraph cable was 400 miles long, and that "gangs of labourers were employed five days and nights paying away the *cable* before the last of it was got on board a ship," called in honour of its freight the *Black Sea;* also, that "the weight of the 400 miles of cable is 100 tons, and the contract is stated to be 20,000*l*."

In sore perplexity the *communem vulgus* wish to know how it happens that this vaunted cable, a work of such vastness that the rapid preparation of it was so "strikingly illustrative of the energy of the British character," said to be 400 miles long and of 100 tons weight, required five days and nights to pay it away on board a ship; and if it were 400 miles long, how much it would have cost per mile, after making fair deductions from the contract price of 20,000*l.* for the cost of conveyance, the delays, the trans-shipments, and the maintenance of the sixty *employés* for a period three or four times as long as had been anticipated? The specimen of the so-called cable displayed in the shop window of Messrs. Newall, in the Strand, would cost for galvanized iron alone little short of 40*l.* per mile (being about a ton and a half to the mile at 25*l.* per ton); and the copper wire enclosed and coated with gutta percha (being No. 1) would cost 20*l.* per mile, making in all about 60*l.* per mile, without accounting for cost of manufacture. Besides, if this cable, as displayed by Messrs. Newall, is upwards of a ton and a half to the mile, how can its weight be, as stated, but 100 tons for the whole 400 miles? Intelligence from the Crimea, and elsewhere, states that it is only a small portion, some fifteen miles or so, at either end, that is protected with the iron wires outside, according to the pattern exhibited by Messrs. Newall, and that all the rest is merely the gutta percha coated wire—a thing in itself about a third, or one-half of the strength of the first experimental wire employed between Dover and Calais!

It seems also a matter of doubt whether this wire exists in continuity, or if it has maintained its continuity as long as its Dover and Calais predecessor; for Mr. Roebuck and others seem to have had great difficulty in getting replies from the Government, who seem much perplexed when questioned, and evidently know but little about these things, and the secrets sometimes connected with them. It is quite evident to those who are versant in these matters, that the great acceleration which has recently taken place in the transmission of our telegraphic news from the Crimea is in consequence of the land line from Bucharest to Varna having been completed; and from the dates of the dispatches received, it is quite clear that ample time elapses for them to be sent from Balaklava to Varna, a distance of only 260 or 270 miles, by steam. For instance, the first dispatch that Lord Panmure vouchsafed to give forth was as follows: "War Department, May 4th, seven P.M.—Varna, May 3rd. A sharp engagement took place before Sebastopol on the night of the 1st of May;" showing that this important tit-bit may have taken steamer's time (in place of a few seconds) on its way to Varna, being thence telegraphed through the various continental systems hither. Since then, with a few exceptions, these dispatches seem to have ceased altogether. No news used to be good news; but with supposed means of speedy transmission the old saw becomes obsolete.

People fancy, when they see the specimen of this cable in the shop-window, that they have got a real telegraph to the seat of war. Let us, if we can, hope that they, as well as the Government, are not deceived, and have not paid 20,000*l.* for an almost useless article, that is put out of sight at the bottom of the sea. If the Government are themselves helpless and ignorant in these matters, why do they not entrust the superintendence of them to Faraday or Wheatstone, and not run the risk of befooling the public and squandering the taxes of the country in inexcusable bungling?

I am, Sir, yours, &c.,
ONE OF THE PUBLIC.

May 14, 1855.

ON THE EXPANSIVE USE OF STEAM.

To the Editor of the Mechanics' Magazine.

SIR,—I have just learned that Mr. Deurance, so favourably referred to in Mr. Williams's volume, as understanding and applying the correct principles of combustion to the locomotive boiler, was among the first to intelligently recognise and adopt, as far as the construction of his engines would permit, the economy of the expansive use of steam, as developed in Mr. Craddock's lectures twelve years since, and that it is in a great measure to his example and his exertions that we may attribute the gradual increase in the steam pressure of locomotives, from 60 lbs. then in use to the 120 lbs. set forth in the exhibited works of Messrs. Brunel, Crampton, and others, in 1851. Mr. Williams has therefore at hand an authority in whom he reposes confidence, to assist in clearing away an error which defaces his work, so soon as his health and time will permit him to redeem that promise. The importance of settling this question in an authoritative work on combustion, and with the least possible loss of time, will be forcibly impressed by the following extract from a late publication of the inventor. After pointing out the total extinction of danger from explosions, the author proceeds: "My boiler of 500 horse power occupies but one quarter the space, and is little above one quarter the weight of the present boiler. The steam can be got up in it to 200 lbs. in one-tenth the time it can be got up to 20 lbs. in the common boiler. The 500 horse power can be got with the steam at 50 lbs., and the remaining 150 lbs. kept in reserve to pursue or get away from the enemy or for any purpose required. If the desire be serious that is prevalent for the means of obtaining great power with shallow draught of water and small consumption of coals, then here are such means. And the above is not an overdrawn representation. I have little doubt but that, which, for a less offensive name, I will call the modern English philosophy, will, as it has done by secret insinuation represent me and my inventions as twaddle. I warn the English people, that they will find it 'serious twaddle' in the hands of the Russians." There is now a great movement of *alleged* public spirit; the "democracy," as it ought to be called consistently with that absurd phrase so prevailing of the "aristocracy" *as a class*, are going to mend our ways and set the right men in the right places, so that we may hope to see the right engines placed rightly also. But meantime any Londoner, influenced by that vulgar quality called inquisitiveness or curiosity, may see at the Ranelagh Wood Works, Pimlico, machinery, which with an ordinary engine required 18 tons of coal per week, driven by the combustion of the mere refuse shavings and saw dust of the manufactory. *Such is the economy of using steam expansively as recommended by Mr. Fairbairn.* As the very best means of clearing up the confused misapprehension in Mr. Williams's otherwise lucid work, I earnestly recommended he should take the means I always take for un-

derstanding anything, and *go and see* what was so incorrectly described. But we are at a great epoch; old things are to be done away and all things made new, and we may trust soon to hear Mr. Fairbairn lecturing on a report of the actual adaptation of expansive economy in our steam navy. Meanwhile, as a puzzle to our reformers, we perceive (according to the jargon) an "aristocrat" in Lord Dundonald, and a "democrat" in Mr. Craddock, receiving an equal share of government patronage.

I am, yours, &c.,

DAVID MUSHET.

May 14, 1855.

P.S. In my last letter, 3¾ *lbs.* was erroneously printed for 3¾ *times.*

SPECIFICATIONS OF PATENTS RECENTLY FILED.

RICKHUSS, JOHN, of Worcester, china potter, and CHARLES TOFT, of St. John, Bedwardine, Worcester, modeller. *Improvements in the manufacture of parian, porcelain, china, and earthenware.* Patent dated October 25, 1854. (No 2268.)

This invention consists in manufacturing articles of the materials named in the title, and in ornamenting them, "by indenting or incising the pattern of the intended ornament or decoration in the moist parian or clay, and then introducing the colouring matter into such indentations or incisures, and bringing the whole to a smooth surface by turning, scraping, shaving, or rubbing, before baking or burning the article."

HENDERSON, WILLIAM, of Cannon-street, London, manufacturing chemist. *Improvements in treating certain ores and alloys, and in obtaining products therefrom.* Patent dated October 25, 1854. (No. 2270.)

Claims.—1. The separation of the precious metals, such as gold, silver, and platinum, when one or more of them occur in the ores, reguluses, or alloys of other metals, by converting the associated metals into oxides by the several methods described, if such metals do not already exist in that state, and afterwards, by fusion with silica or matters containing silica, converting these metals into silicates, whilst the precious metals, being reduced by heat alone, are separated from the scoria or slag in a nearly pure state. 2. The preparation of the ores of zinc and other volatile metals, when they contain an excess or deficiency of sulphur, as described. 3. The use of a mixture of chlorides and nitrates of alkali, or other oxidizing agents, for the purpose of decomposing ores in the process of calcination. 4. Certain means described for separating and obtaining arsenic, antimony, tin, and several other metals, or the oxides or salts of arsenic, antimony, tin, and several other metals from zinc, copper, lead, silver, gold, and other metals whose chlorides are not volatile at a low red heat. 5. The manufacture of chloride, oxide, or carbonate of zinc in the manner described.

ROBERTS, RICHARD, of Manchester, engineer. *Improvements in machinery for preparing and spinning cotton and other fibrous substances.* Patent dated October 25, 1854. (No. 2272.)

This invention consists—1. In means for varying the angle of feeding apparatus in combing machines, so that the plane of the feed shall be kept in line with the pull whilst the tuft of fibre is being detached. 2. In means for adapting the taking comb, brush, or nipper to recede from the feeding apparatus whilst taking fibre, and to advance when disengaging it. 3. In adapting the traversing apparatus of balling machines for producing a more cylindrical lap than heretofore. 4. In applying a rail or spring to a self-acting mule, in such manner, that by its action on the winding-on drum, supplementary motion may be given to the spindles, and snarls in the yarn prevented.

SMITH, WILLIAM THOMAS, of New Hampstead-road, Kentish-town, Middlesex, surveyor, and GEORGE HILL, of the City-road, gentleman. *Improvements in machinery or apparatus for winnowing, washing, sifting, or separating corn, gravel, minerals, and other materials.* Patent dated October 25, 1854. (No. 2273.)

On a strong frame or framing, having one or more sides than the number of screens required, the same number of standards are erected, between which the several mouths of the screens work. Attached to these standards, which are grooved on the outer side, are an equal number of division boards to keep the material operated upon separate as it comes from the mouth of the screens, whose gyrations are made to be from right to left, or *vice versâ*, their horizontal motion not being fully circular, but so far as the side appropriated to the exit of the screened material will allow. This exit is made either at once from the mouth of the screens, or from a fixed shoot into a truck or other receiver, as desired. An upright perforated metal tube, serving to wash the material by means of jets of water issuing from the perforations into the screens, has its lower end stopped and formed as a pivot working on a capped step or bearing. On this tube are fixed a suitable number of screen frames (provided with the shoots before referred to), which are fitted with movable screens, so as to elevate or depress the side furthest from the shoot as the quality or size of the material may differ, or as a greater or less

quantity of any one size may require. On the upper end of the upright tube above the collar in which it works is a stuffing-box with a service pipe attached to supply air, water, or other matter between the screens.

HUGHES, RICHARD HUGH, of Hatton-garden. *Improvements in transmitting motive power.* Patent dated October 25, 1854. (No. 2274.)

In carrying out this invention a shaft or axis which receives motion from a steam engine or other power has on it one or more cog-wheels which are not fixed but are capable of moving thereon. Each of these wheels is connected with the shaft or axis by means of one or more coiled springs. One end of each spring is fixed to the shaft or axis, and the other end is fixed to the outer part of the wheel. These cog-wheels give motion to another shaft by taking into pinions upon it. The springs are wound up by levers acting on ratchets on the first shaft.

MATHER, COLIN, of Salford Ironworks, Manchester. *Improvements in machinery for boring in the earth, and for actuating a hammer for driving tubes into the earth, and other uses.* Patent dated October 25, 1854. (No. 2275.)

This invention consists of certain modifications of a former patent, in which cutting tools, a hammer, &c., are actuated by steam.

LAMBERT, FRANÇOIS, chemist, of Rue d'Enfer, Paris. *Improvements in compounds to be used as cosmetics.* Patent dated October 25, 1854. (No. 2276.)

This invention "consists in introducing, in the preparation of cosmetics, chemical substances capable of reacting one on the other, so as to develop a dynamic electricity which strengthens the hair, the beard, and the other parts of the human body upon which the stimulating action of the electricity may render the employment of these compositions suitable."

HELIN, LOUIS VITAL, of Rue des Douze Apôtres, Brussels, Belgium, chemist. *Improvements in the manufacture of paper from straw.* Patent dated October 25, 1854. (No. 2278.)

In carrying out this invention the straw is steeped in water, then washed, then rolled, or acted upon by millstones, and then dried. It is afterwards steeped in alkaline solutions of soda or potash, exposed to air, and then subjected to one or more of the following baths :—*First*, of carbonate of soda or of potash 8 lbs., and water 20 gallons. *Second*, bicarbonate of soda or of potash 6 lbs., and water 20 gallons. *Third*, caustic potash or soda, 4 lbs., and water 20 gallons. *Fourth*, hypochloride of potash or of soda 10 lbs., and water 20 gallons. *Fifth*, hypochloride of lime or bleaching powder 1¼ lbs., water 20 gallons, to which may be added in addition, if necessary, 1¼ lbs. of bleaching powder.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in circular looms.* (A communication.) Patent dated October 25, 1854. (No. 2279.)

The inventor claims the application and use in circular looms of flexible spindles in place of spring needles; the construction and arrangement of certain vertical hooked blades and their application in conjunction with slotted inflexible spindles; the mode of actuating the hooked blades by means of eccentric inclines; and certain peculiar constructions and arrangements of thread feeders or supplyers.

CRAIG, WILLIAM GRINDLEY, of Gorton, near Manchester, Lancaster, engineer. *Improvements in the mode or method of consuming smoke, and in the machinery or apparatus employed therein.* Patent dated October 26, 1854. (No. 2280.)

This invention consists in "the arrangement of one or more furnaces or fire places projecting from, or formed in, upper or lower shelves, or in one continuous line within the fire box, in conjunction with a series of water spaces, blocks, or bridges, forming obstructions and chambers or passages for smoke or flame, causing them to pass through, under, or over the coked or carbonized fire in advance of or below the coal or green fire or fires, with a revolving bar or grate and a door or doors to the water spaces by which, with the admission of oxygen, or atmospheric air at the time the fire or furnace is fed with fresh fuel, the smoke is consumed."

HEALEY, JOHN, engineer, and JOHN FOSTER and JOHN LOWE, spindle-makers, all of Bolton-le-Moors, Lancaster. *Improvements in machinery to be used for drawing, moulding, forming, and forging articles in metal.* Patent dated October 26, 1854. (No. 2282.)

In working with this improved machinery the material to be operated upon is entered between the rolls on the same side as that on which it is delivered. The rolls employed have flat or sunk places upon them, which are arranged so as to come opposite each other every revolution, leaving, for a moment, a space between them through which the metal is entered; and if this is done while they are revolving, the speed is regulated to give the necessary time. Two hammers mounted in arms on revolving shafts are also employed.

ECCLES, JOSEPH, of Blackburn, Lancaster, cotton-spinner. *Improvements in machinery for the manufacture of bricks.* Patent dated October 26, 1854. (No. 2283.)

Claim.—The arrangement and mode of constructing mould boxes for the manufacture of bricks with hollows in them, when used in machines which form or mould such bricks from dry or untempered clay or materials by compression.

OLIVIER, CHARLES HENRY, of Finsbury-square, London, commission-merchant. *An improved apparatus for drying.* (A communication.) Patent dated October 26, 1854. (No. 2284.)

The inventor describes an arrangement of apparatus for drying materials in closed dark chambers by means of steam.

FONTAINEMOREAU, PETER LECOMTE DE, of South-street, London. *Improvements in bleaching, dyeing, and preparing hemp and flax to be spun.* (A communication.) Patent dated October 26, 1854. (No. 2285.)

Claims.—1. The submitting of peeled hemp to fermentation by means of hot water for softening and separating the fibres, as described. 2. A certain contrivance for, and mode of bleaching and dyeing flax and hemp. 3. Preparing hemp and flax to be spun, after they have been bleached or dyed, by submitting them to beating, and to an operation analogous to the processes employed for peeling flax.

GRIFFITHS, JAMES, of Wolverhampton, Stafford, engineer. *Improvements in the mode or process of manufacturing certain kinds of iron, and in the machinery or apparatus used in such manufacture, parts of which improvements are also applicable to machinery used in the manufacture of other descriptions of iron.* Patent dated October 26, 1854. (No. 2287.)

This invention consists—1. In an improved method or process of manufacturing iron of small sizes, by forming strands of twice the width of the proposed bars, and dividing such strands lengthwise by cutting apparatus of a novel construction; also, by shortening the process of preparing the billets for making such iron by the use of similar cutting apparatus to produce such billets, by dividing puddle bars or piled bars longitudinally for that purpose. 2. In certain additions to, or improvements in the ordinary rolling machinery constituting the cutting apparatus employed to divide the strand or bar before mentioned. 3. In an improved combination of mechanical parts for regulating, varying, and adjusting the distance between the finishing rolls, which mechanism is also applicable to other rolls which require frequent adjustment.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *An improved mode of operating trip hammers.* (A communication.) Patent dated October 27, 1854. (No. 2289.)

This invention consists in attaching to the stem or rod of the hammer a piston working in a cylinder which is open at the top and closed at the bottom, and is provided with valves or their equivalents by which the air can be excluded, or admitted under the piston, for the purpose either of adding the whole, or such part of the pressure of the atmosphere as may be desirable, or of creating resistance to the weight of the hammer in giving the blow.

PRICE, ASTLEY PASTON, of Margate, Kent, chemist. *Improvements in the calcination and oxidation of certain metallic, mineral, and metallurgical compounds, and in the apparatus and means for effecting the same.* Patent dated October 27, 1854. (No. 2291.)

Claim.—"The employment of revolving tubes or retorts, heated externally, and so arranged as to admit into their interior air or steam highly heated, or otherwise free from the products arising from the combustion of the fuel employed in the heating of such revolving retorts or tubes, or of their contents, and to allow of the exit of the products of the oxidation or calcination."

ASHTON, WILLIAM, of Preston, Lancaster, engineer. *Improvements in safety or escape-valves.* Patent dated October 27, 1854. (No. 2292.)

This invention consists, according to one modification, in the employment of a hollow piston or tube sliding vertically in a closed outside casing fitted on to the top of the boiler or other vessel. Only one valve seat is used, the valve being formed either by an enlargement on the upper portion of the tube, the shoulder of which enlargement rests upon the valve seat when closed, or the tube may be of the same diameter throughout, its lower end resting, when closed, on the valve seat. The steam enters the interior of the tube (which is closed at one or both ends) by a lateral opening, and escapes by a similar opening at the upper end, or by the opening left between the lower end of the tube and the valve seat when the valve is raised.

WILKINSON, WILLIAM BOUTLAND, of Newcastle-on-Tyne, plasterer and manufacturer of artificial stones. *Improvements in the construction of fire-proof dwellings, warehouses, and other buildings, or parts of the same.* Patent dated October 27, 1854. (No. 2293.)

The inventor describes certain methods of constructing cellular partitions, floors, &c., that are intended to be impervious to fire.

MORGAN, JABEZ, of Kidderminster, Worcester, engineer. *Improvements in machinery or apparatus for cutting metals.* Patent dated October 28, 1854. (No. 2295.)

Claims.—1. A mode of actuating the cutting blades of shearing-machines by means of an eccentric or eccentrics working in an

opening, recess, or chamber, formed either in the blade itself or in a frame cast on or otherwise connected to the blade. 2. A certain mode of adjusting the cutting edges of plate-shearing machines. 3. The application and use of a moveable table in plate-shearing machines for supporting the severed portion of the plate. 4. The application and use of an adjustable gauge-bar or guide for guiding the plate during its traverse through the machine. 5. The application and use of plate-shearing machines with the sides of the standard cut away or recessed to receive the plate and allow it to pass through the machine.

LINDNER, EDWARD, of New York, United States of America. *Improvements in revolving-breech fire-arms and magazine.* Patent dated October 28, 1854. (No. 2297.)

This invention consists in providing below the gun-barrel an extra charge-barrel, which contains from thirty to fifty cartridges. Between the gun and charge-barrel is a rack in connection with a piston or slide which acts upon the cartridges, and which is itself in connection with the gun-lock in such manner that each time the gun is fired off one of the cartridges is forced into a revolving breech-piece, by which means the whole of the cartridges contained in the charge-barrel can be rapidly fired off. The revolving breech-piece is turned round each time the gun is cocked, one-sixth part, by a mechanism applied to the inside of it. The percussion-caps are brought opposite the nipple by an arrangement of springs, and are put on by the hammer itself at the moment the gun is fired off, the old caps being thrown off from the nipple when the gun is cocked. The needle-lock is so arranged that the needle, after having entered the cartridge sufficiently far to ignite the priming, springs suddenly back, by which arrangement any heating of the needle is prevented, and the application of a revolving breech-piece is permitted.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

STOCKER, ALEXANDER SOUTHWOOD, of the Poultry, Cheapside, London, manufacturer. *Certain improvements in the manufacture of tubes applicable to gas and other purposes, also in the construction of certain engineering machinery and apparatus, and the application of the whole or part of the same to, and other means to be used or employed in, the manufacture of tubes, also in the mode of manufacturing and the application of certain articles connected with or necessary to the completion of such or other tubes.* Application dated October 25, 1854. (No. 2271.)

This invention consists in manufacturing tubes of such diameter that they shall fit one within the other telescopically, and when two or more are placed one within another submitting them to a bath of soldering or other material by which all the interstices will be filled up, and the whole, when taken from the bath and allowed to cool, become a solid tube.

PECHENARD, EDOUARD, contractor, of Monthermé Canton, French Empire. *Certain improvements in roofs or coverings for buildings.* Application dated October 25, 1854. (No. 2277.)

The inventor's roofs or coverings are formed of slate or other suitable covering medium, and of wrought or cast-iron beams, and transverse rafters or supports, which drop into steps or grooves cut in the sides of the beams. The slates are held in position by a band or strip, which lies over and parallel with the beam, and overlaps the sides of the slates on each side of the beam. This band is secured (and thereby the slates also) to the beam, by means of a bolt with a broad head and screw-threaded point. This bolt passes first through an orifice in the band, then through the space left between the plates in setting them up, then traverses an aperture in the beam, and is finally secured from the inside of the roof by means of a nut.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent-agent. *An improved method of obtaining alcohol from organic substances, and particularly from wood.* (A communication.) Application dated October 26, 1854. (No. 2281.)

The wood or other organic substances, in their dry state, are reduced into very small pieces, and subjected to the action of concentrated sulphuric acid. The mixture is afterwards diluted with water, and then subjected to the action of carbonate of lime, in order to neutralize the excess of sulphuric acid. The sulphate of lime which is formed is separated from the liquid by filtration or decantation; the remaining liquid is fermented with yeast or otherwise, and alcohol is obtained by distillation.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in transferring coloured pictures, portraits, and engravings.* (A communication.) Application dated October 26, 1854. (No. 2286.)

"By means of a lithographic process," says the patentee, "I obtain an exact outline of the subject to be transferred upon paper, which can then be transferred either upon paper, stone, glass, leather, metal, wood, or any other substance, and by submitting this to a lithocromic operation I obtain the coloured reproduction of the object."

DUDGEON, JOHN, of 151, Fenchurch-

street, in the city of London. *An improvement in rendering ships and batteries shot-proof.* Application dated October 26, 1854. (No. 2288.)

The inventor faces ships, batteries, &c., with double iron casings containing water under pressure, and of such external forms that they will deflect and fling off impinging shot, shell, &c.

TURNER, JOHN, overlooker, BENJAMIN HOLDSWORTH, overlooker, and ROBERT HARTLEY, beamer, of Burnley, Lancaster. *Certain improvements in power-looms for weaving.* Application dated October 27, 1854. (No. 2290.)

These improvements relate to power-looms in which check-straps are used at each end of the slay or lathe; and the inventors "employ a bracket secured to the side of the slay, as well as a check-strap furnished in the middle with a button or stop, and working between the cheeks of the bracket on a small spindle; but the peculiar novelty of our invention consists," say they, "in the application of a friction plate beneath the button of the check-strap, and acting upwards and against it by means of springs."

PROVISIONAL PROTECTIONS.

Dated February 15, 1855.

343. Benjamin Gower, of Stratford, Essex, engineer. Improvements in cannons and pieces of ordnance, and in shot and projectiles for cannons and pieces of ordnance.

Dated March 30, 1855.

707. William Crozier, of Sunderland, Durham, civil engineer. The better extinction of fire.

Dated April 14, 1855.

825. Joseph Armstrong, of the Normanton Station, Wakefield, and John Livingston, of Leeds. Improvements in certain parts of the permanent way of railways.

827. Jane Ann Herbert, of Waterden-place, Guildford, Surrey, widow. Improvements in propellers for vessels, which are denominated the conical propellers. A communication from William D. Jones, of Pokeepsie, and Henry Winfield, of New York, United States of America.

829. Thomas Kennedy, of Kilmarnock, Ayr, gun-manufacturer. Improvements in shot or projectiles.

Dated April 16, 1855.

831. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in the production of a felted tissue, applicable to replacing leather in the manufacture of cards. A communication.

833. Richard Husband, of Manchester, Lancaster, hat-manufacturer. Certain improvements in the manufacture of hat-plushes of spun silk and other spun yarns.

835. Edward Hammond Bentall, of Heybridge, Essex, ironfounder. An improvement in the construction of harrows.

837. George Beard, of Birmingham, Warwick, manufacturer. An improved label and stamp setter.

Dated April 17, 1855.

839. Arthur Wellington Callen, of Camberwell Surrey, gentleman, and Joseph West, of Guernsey engineer, and George Washington Lewis, of Bristol, United States. Improvements in the construction and fittings of tents, especially suitable for military purposes.

841. Philippe Amédée Devy, of Old Jewry Chambers, Old Jewry. Improvements in the frames of swing looking-glasses. A communication.

843. George Fergusson Wilson, of Belmont, Vauxhall, and Warren de la Rue, of Bunhill-row. Improvements in combining fluids to be burned in lamps.

845. Edward Ellis Allen, of the Strand, Middlesex, engineer. Improvements in steam engines.

847. Robert Calvert Clapham, of Ardrossan, Ayr, analytical chemist. Improvements in the manufacture or production of the salts of baryta and of artificial iron pyrites, and in the application thereof in the manufacture or production of salts of soda or other alkaline salts.

Dated April 18, 1855.

849. Henry Woodhouse, of Stafford, engineer. Improvements in the construction of crossings for the permanent way of railways.

851. Louis Dameron, of Paris, coach-manufacturer. Improvements in the construction of carriages.

853. John Kay, of Bonhill, Dumbarton, calico-printer. Improvements in preparing and printing textile fabrics and other surfaces.

855. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for moulding and casting fusible or plastic materials, and in covering or coating articles with such materials. A communication.

857. William Madeley, of Manchester, Lancaster, machinist, and Thomas Hanlon, of the same place, mechanic. An improvement in or applicable to power looms.

859. Frederick Russell, of Cumberland Market, Regent's-park, Middlesex, mechanic. Improvements in hanging window-sashes.

861. William Vaughan Edwards, of Swindon, Wilts, ironmonger. An improved economic portable boiler and cooking-apparatus.

Dated April 19, 1855.

863. Thomas Lees, of Birmingham, Warwick, manufacturer. An improvement or improvements in metallic pens.

867. William Bishop, of Old Fish-street Hill, Upper Thames-street, London, stationer. An improved mode of ornamenting writing-papers.

871. Peter Lear, of Boston, Massachusetts, United States of America. An improved method of arranging and operating horizontal submerged propellers.

873. William Savory, engineer, of Gloucester. Improvements in machinery for crushing grain and other substances, and for cutting chaff.

875. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of articles of hard India-rubber or gutta percha, or compounds thereof, and in coating or covering articles with the like materials. A communication.

Dated April 20, 1855.

877. John Charles Pearce, of the Bowling Ironworks, near Bradford, York, engineer. Improvements in making the joints of pipes and other articles.

879. William Ryder, of Bolton-le-Moors, Lancaster, spindle and flyer-maker. Improvements in certain parts of machinery for slubbing and roving cotton and other fibrous substances.

881. Claude Laurent Victor Maurice, civil engineer, of St. Etienne, Loire, French Empire. Cer-

tain improvements in carbonizing coal, and in apparatus to be employed therein.

883. John Lord, of Rochdale, Lancaster, manufacturer. Improvements in temples for power-looms.

885. Horatio Allen, of the Novelty Iron-works, New York, United States of America, civil engineer. Improvements in the valves of steam and other engines.

887. William Lee Bennett, of Wolston, Warwick, gentleman. An improvement or improvements in seed-drills.

889. John Drury, of Paddock, near Huddersfield, York, machine-maker. Improvements in steam boilers for preventing explosion thereof.

Dated April 21, 1855.

891. William Gerhardi, of Manchester, mechanic. Improvements in apparatus to prevent the lapping of straps round shafts.

895. William Prior Sharp and William Weild, of Manchester, Lancaster, machinists. Improvements in the manufacture, and in machinery for the manufacture of spun or thrown silk threads.

897. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for spinning cotton and other fibrous materials. A communication from Messrs. Constant, Pengeot, and Co., of Andincourt, France, manufacturers.

899. William Alexander Edwards, of Brook-street, West-square, Lambeth, Surrey, engineer. Separating certain metals from metallic substances.

901. Samuel Walsh and John Henry Brierley, small-ware manufacturers, of Stannary-works, Halifax, and Noble-street, Cheapside, London. A clasp or fastener for belts, bands, or straps.

Dated April 23, 1855.

903. Joseph Whitworth, of Manchester, Lancaster, engineer. Improvements in ordnance, fire-arms, projectiles, and machinery for the manufacture thereof.

905. John Orr, of Glasgow, Lanark, manager, and James Templeton, of the same place, manufacturer. Improvements in the manufacture of figured fabrics.

907. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improved machinery for separating substances of different specific gravity. A communication.

Dated April 24, 1855.

910. Joseph Taylor, of King-street, Westminster, gentleman. Improvements in propelling vessels.

911. William Westley Richards, of Birmingham, Warwick, gun-manufacturer. An improvement or improvements in repeating or revolving fire-arms.

912. Josiah Horsfall, of Manchester, Lancaster, joiner. Machinery for mitreing moulded and other sashes.

913. James Hunter and George Hunter, both of Leysmill, Forfar, engineers. Improvements in stone cutting machinery.

914. Francis McKenna, of Salford, Lancaster, manager. Certain improvements in power-looms for weaving.

915. Frederic James Utting, of Wisbeach, Cambridge, engineer and ironfounder. Improvements in land-rollers and clod-crushers.

916. Matthew Andrew Muir, of Glasgow, Lanark, machinist. Improvements in the manufacture of moulding of railway chairs.

917. Charles Piazzi Smyth, of Hillside-crescent, Edinburgh. Improvements in astronomical and geodetical instruments.

918. Charles Jordan, of Newport, Monmouth, ironfounder. An improvement in discharging cannon.

Dated April 25, 1855.

921. Louis Alexandre Avisse, of Paris, France, pianoforte-manufacturer. Improvements in lubricating revolving shafts of all descriptions, and also the axles of railway and other wheels.

923. James Wallace, junior, of Glasgow, Lanark, manufacturer. Improvements in bleaching, washing, or cleansing textile fabrics and materials.

924. Mark Mason, of Dukinfield, Chester, machinist. Improved machinery or apparatus for manufacturing sole-tips and heels for clogs, boots, or other coverings for the feet.

925. John Joseph Victory, of Henrietta-street, Middlesex, carpenter. Certain apparatus for marking out curved lines upon wood and stone, specially adapted to the marking out of hand-railings, together with improved machinery for boring and sawing wood.

926. John Black, of Hampstead-road, Middlesex, sculptor. Improvements in axles, shafts, and bearings.

927. John Hunter, of Liverpool, Lancaster, gentleman. Improvements in the distillation of turpentine and other resinous substances. A communication.

928. Auguste Edouard Loradoux Bellford, of Essex-street, London. A new and improved machine for planing screw-nuts and bars of any prismatic form. A communication.

929. Auguste Edouard Loradoux Bellford, of Essex-street, London. An improved gas-regulator. A communication.

930. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in the manufacture of seamless garments or other useful articles of felt. A communication.

931. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in scales or machines for weighing. A communication.

932. John Bryant Wilkin, of Helston, Cornwall. Improvements in stamping and dressing or separating ores of any kind, but more especially tin ores.

933. Auguste Edouard Loradoux Bellford, of Essex-street, London. An improved chaff cutting machine. A communication.

934. Auguste Edouard Loradoux Bellford, of Essex-street, London. A new and improved lock for sliding doors. A communication.

936. Samuel Draper, of Lenton, near Nottingham. Improvements in apparatus for retarding and stopping railway trains.

937. Julius Jeffreys, of Kingston Hill, Surrey. Improvements in engines or machines for raising, diffusing, or injecting fluids.

938. Edward Frankland, of Owen's College, Manchester, Lancaster. Improvements in the treatment of certain salts, commonly called alums, to obtain products therefrom.

939. George Augustus Huddart, of Brynkir, Carnarvon, Esq. Improved machinery for obtaining motive power from running waters.

940. Joseph Peabody, of Old Broad-street, London, gentleman. An improved construction of hay-making machine. A communication.

941. John Silvester, of Smethwick, Stafford, engineer. Improvements in spring balances, and in their connection and adjustment to steam valves.

942. George Augustus Huddart, of Brynkir, Carnarvon, Esq. Improved machinery for obtaining and applying motive power.

Dated April 26, 1855.

943. John Elce and John Bond, of Manchester, Lancaster, machinists. Improvements in casing, guarding, and protecting revolving shafts and mill work in general.

944. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in apparatus for preventing the escape of fluids, which he calls diaphragm obturator. A communication.

945. Auguste Edouard Loradoux Bellford, of Essex-street, London. A new combination of slide-valves and ports for the induction and eduction of steam or other elastic fluid, in steam engines or other engines of similar character. A communication.

946. William Shears, of Bankside, Southwark. An improvement in cases or magazines for gunpowder or other explosive preparations or compounds.

947. Thomas Haley Burley, of Ohio, United States of America. A new and useful machine for making dovetails.

Dated April 27, 1855.

948. Robert Paul Coignet, Captain en retraite du Génie, of Rue du Bac, Paris, France. Certain improvements for rendering tissues waterproof.

949. Peter Armand Lecomte de Fontainemoreau, of South-street, London, patent agent. Application of certain primitive products to the manufacture of bearings, and all parts of apparatus subjected to friction. A communication.

950. Alfred Crosskill, of Beverley, York, civil engineer. Improvements in machinery for turning and spreading cut grasses or hay.

951. Thomas Page, of Middle Scotland-yard, Middlesex, civil engineer. Improvements in ordnance.

953. Jean Charles Guillaume Massiquot, of Paris, France. Certain improvements in lithographic presses and inking-apparatus connected therewith.

955. Henry Collett, of Grosvenor-street, St. Peter's-street, Islington. Improvements in pumps, or machinery for raising water or other fluids.

956. Edward Myers, of Rotherham, York, engineer, and John Wright Potter, of the same place, gentleman. Improvements in stoves for warming apartments.

957. Richard Clark, lamp-manufacturer, of the Strand, London, and John Thomas Stroud, lamp-manufacturer, of Suffolk-street, Birmingham, Warwick. Certain improvements in lighting, applicable to table, street, signal, and other lamps, as also for the constructing, denoting, and regulating the signals and burners of lighthouses.

Dated April 28, 1855.

958. Thomas Knowles and James Knowles, of Manchester, Lancaster, engineers. Improvements in steps and bolsters to be used in machinery for spinning, doubling, winding, and similar processes.

959. Daniel Warren, of Exmouth, Devon, gentleman. Certain improvements in obtaining and applying motive power.

960. Frank James Wilson Packman, of Puckeridge, Herts, doctor of medicine. Improvements in projectiles, in projectile instruments, and in the means of charging the same.

961. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improvement in file-cutting machinery. A communication.

962. William Elliot Carrett, of the Sun Foundry, Leeds, York, engineer. Improvements in motive-power engines.

963. James Marsh, of Store-street, Bedford-square, Middlesex, pianoforte-manufacturer. Improvements in the construction of pianofortes, for rendering them more portable.

Dated April 30, 1855.

965. Edward Acres, of Pouldrew Mills, Waterford, miller. Improvements in desiccating and cooling atmospheric air, and the application thereof to useful purposes.

967. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in regulating the pressure or flow of gas or fluid bodies. A communication from Samuel W. Brown, of Lowell, Massachusetts, United States of America.

969. Henry Francis, of West Strand. Improvements in manufacturing boots and shoes.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 15th,* 1855.)

2757. George Mallinson and Horatio Ridings. An improved manufacture of woven fabric.

12. John Keir Harvey and Daniel Pearce. A calendar inkstand.

17. Samuel Aspinwall Goddard. A new or improved fire-arm, a portion of which is applicable to ordnance.

20. Charles Hustwick and William Bean. Improvements in buffers and springs for railway-carriages and other purposes.

28. George Bowden. Improvements in the manufacture of united adhesive book-headband and register ribbons.

40. George Hallen Cottam and Henry Richard Cottam. An improvement in the manufacture of iron bedsteads.

42. William Grindley Craig. Improvements in railway-buffer cases and rams.

43. John Huggins. A new or improved machine for the manufacture of lint.

50. Samuel Smith Shipley. Improvements in machinery and apparatus for washing or cleansing.

53. Joseph Offord. Improvements in the construction of carriages.

56. Nathaniel Jones Amies. Certain improvements in winding or balling thread or yarn, and in the machinery or apparatus connected therewith.

58. Ebenezer Bow. Improvements in the manufacture or production of "blackening" for foundry purposes.

62. Bartholomew Predaval. Improving the production and manufacture of pulp for the making of paper.

65. William Coles Fuller. Improvements in the construction and adaptation of India-rubber springs.

72. Alexander Robertson. A new manufacture of packages for dry goods.

84. Ezra Miles. An improved coupling joint or connection for tubing or other purposes.

87. Francis Preston. Improvements in ordnance and in projectiles for ordnance and small arms.

88. William Barningham. Improvements in connecting the rails of railways.

93. William Henry Nevill. Improvements in the construction of reverberatory furnaces for the collection and condensation of volatile substances.

98. Edward Lambert Hayward. Improvements in kitchen ranges.

102. Francis Burke. Improvements in and apparatus for obtaining from the plantain, banana, aloe, penguin, and other vegetable substances, fibres applicable to various manufacturing purposes.

120. Joshua Horton. An improvement or improvements in packing or storing gunpowder.

135. William Johnson. Improvements in the application, treatment, cleansing, and dyeing of fibrous substances and products. A communication.

184. William Edward Newton. Improved machinery for raising and forcing fluids. A communication.

234. Arthur Lyon. Improvement in sausage-making or mincing machines.

293. George Briggs. An improved spring for carriages.

311. John Langman. Improvements in portable buildings, specially adapted to campaigning purposes.

316. George Hallen Cottam and Henry Richard Cottam. Improvements in the construction of iron buildings.

343. Benjamin Gower. Improvements in cannons and pieces of ordnance, and in shot and projectiles for cannons and pieces of ordnance.

355. George Tomlinson Bousfield. Improve-

ments in preparing wool and other fibrous substances for spinning. A communication from Jean Joseph Jules Pierrard.

569. John Kidder. Improvements in the construction of castors.

657. Jean Baptiste Dechanet and Antoine Dominique Sisco. Improvements in the process of manufacturing metallic tubes and pipes, and in the machines or apparatus used for that purpose.

663. John McKinnell. Improvements in ventilation.

671. John Marland. Improvements in preparing for and in sizing and warping woollen and worsted yarn.

699. Alexander McDougal. An improved method of consuming smoke in steam-engine or other furnaces or fire-places.

703. Robert Johnson, William Whittle Johnson, and Robert Johnson, the younger. A new and improved covering for surfaces, linings, roofs, and spaces.

707. William Crosier. The better extinction of fire.

741. Peter Rothwell Jackson. Improvements in machinery for making patterns and for moulding therefrom.

763. Joseph Edwin Frost. An improvement in ball or float-cocks.

821. Richard Archibald Brooman. Improvements in the treatment of fatty and resinous matters, and in preparing them for the manufacture of candles and other articles. A communication.

835. Edward Hammond Bentall. An improvement in the construction of harrows.

837. George Beard. An improved label and stamp-setter.

843. George Fergusson Wilson and Warren de la Rue. Improvements in combining fluids to be burned in lamps.

847. Robert Calvert Clapham. Improvements in the manufacture or production of the salts of baryta and of artificial iron pyrites, and in the application thereof in the manufacture or production of salts of soda or other alkaline salts.

854. Richard Bridge. Certain improvements in power-looms.

855. John Henry Johnson. Improvements in machinery or apparatus for moulding and casting fusible or plastic materials, and in covering or coating articles with such materials. A communication.

857. William Madeley and Thomas Hanlon. An improvement in or applicable to power-looms.

868. Alfred Vincent Newton. Improved machinery for crushing and grinding mineral and other substances. A communication.

871. Peter Lear. An improved method of arranging and operating horizontal submerged propellers.

875. John Henry Johnson. Improvements in the manufacture of articles of hard India-rubber or gutta percha, or compounds thereof, and in coating or covering articles with the like materials. A communication.

879. William Ryder. Improvements in certain parts of machinery for slubbing and roving cotton and other fibrous substances.

884. Samuel Cunliffe Lister. Improvements in treating the rhea plant, so as better to prepare its fibres before being spun.

890. Edwin Pettitt. Improvements in preparing and spinning cotton and other fibrous substances, and in machinery for such purposes.

891. William Gerhardi. Improvements in apparatus to prevent the lapping of straps round shafts.

896. John Henry Johnson. Improvements in the construction or prevention of smoke. A communication from René Garcon, of Paris, France, accountant.

897. John Henry Johnson. Improvements in machinery or apparatus for spinning cotton and other fibrous materials. A communication from Messrs. Constant, Pengeot, and Co., of Andincourt, France, manufacturers.

903. Joseph Whitworth. Improvements in ordnance, fire-arms, projectiles, and machinery for the manufacture thereof.

905. John Orr and James Templeton. Improvements in the manufacture of figured fabrics.

907. Alfred Vincent Newton. Improved machinery for separating substances of different specific gravity. A communication.

916. Matthew Andrew Muir. Improvements in the manufacture or moulding of railway-chairs.

920. William Symington. An improvement in preparing peas, and pearl and Scotch barley for culinary purposes.

921. Louis Alexandre Avisse. Improvements in lubricating revolving shafts of all descriptions, and also the axles of railway and other wheels.

923. James Wallace, junior. Improvements in bleaching, washing, or cleansing textile fabrics and materials.

937. Julius Jeffreys. Improvements in engines or machines for raising, diffusing, or injecting fluids.

947. Thomas Haley Burley. A new and useful machine for making dovetails.

961. Alfred Vincent Newton. An improvement in file-cutting machinery. A communication.

962. William Elliot Carrett. Improvements in motive power engines.

967. William Johnson. Improvements in regulating the pressure or flow of gas or fluid supplies. A communication from Samuel W. Brown, of Lowell, Massachusetts, United States of America.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed May 11, 1855.

2412. Samuel Pearson.
2424. George Henry Ingall.
2425. Peter Knowles and Edward Kirby.
2429. Samuel Fenton.
2431. John Platt.
2433. William Low.
2437. James Higgins and Thomas Schofield Whitworth.
2444. William Coulson.
2449. Edouard Belmer.
2502. John Clarke.
2520. William Taylor.
2526. Edward Briggs and William Souter.
2528. Julian Bernard.
2614. William Chippindale and Leonard Robert Sedgwick.

1855.

144. Robert Martin and Jacob Hyams.
231. Henry Davis Pochin.
374. Frederick Blacket Edward Beaumont.
406. Benjamin Looker, junior.
608. Edmund Reynolds Fayerman.

Sealed May 15, 1855.

2415. Jean Marie Chevron and Charles Victor Frederic de Roulet.
2513. John Moore Hyde.
2568. Joseph Phelps.
2618. Auguste Edouard Loradoux Bellford.
2700. Louis Joseph Frederic Margueritte.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

R. N. B.—There would be no difference in the cost, about £43. Copies of Specifications can be purchased at the Office of the Commissioners of Patents, Southampton-buildings, Chancery-lane. The price varies with the length of the description and the number of drawings.

An Engineer.—We have received your letter. Will you favour us with your address?

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne Paris; Mason and Co., Dublin; W. C. Campbell and Co., Hamburg.

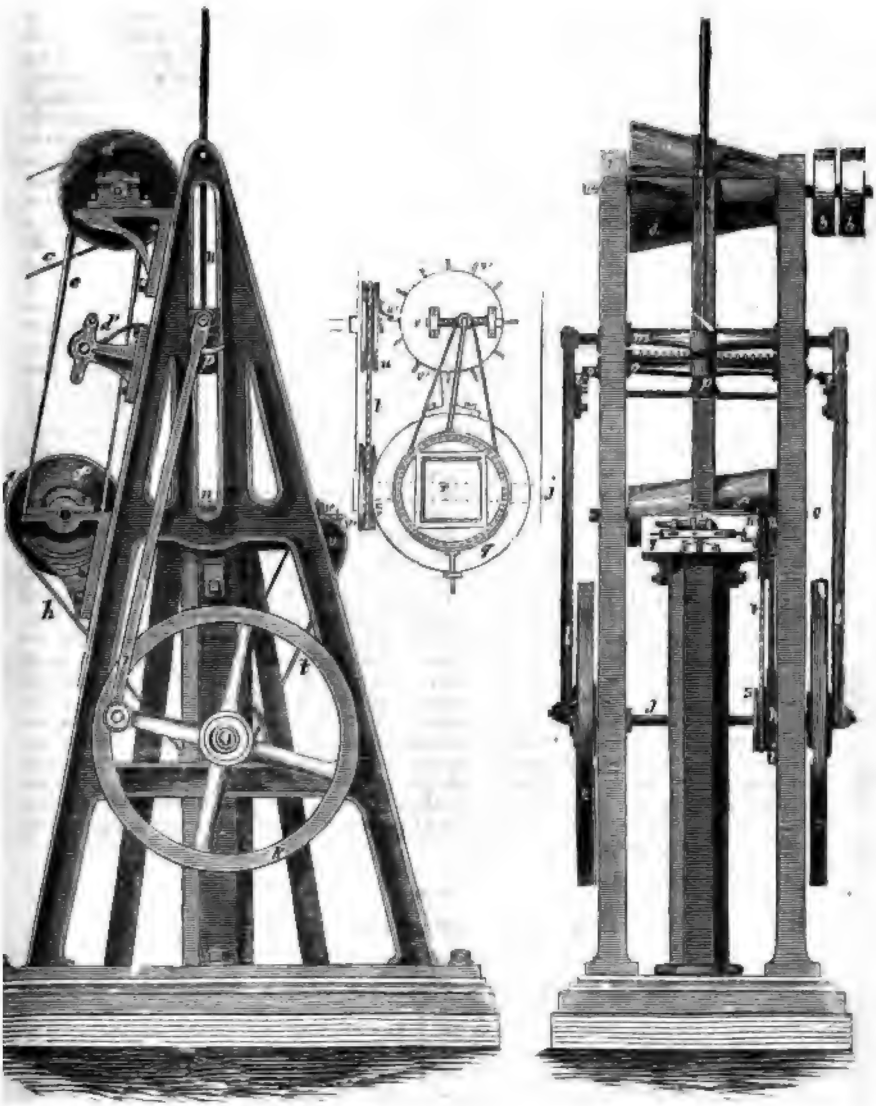
Mechanics' Magazine.

No. 1659.] SATURDAY, MAY 26, 1855. [Price 3d. Stamped 4d

Edited by R. A. Brooman, 166, Fleet-street.

BENNETT'S PATENT MACHINERY FOR BEATING GOLD, SILVER, AND OTHER METAL LEAF.

Fig. 1. Fig. 3. Fig. 2.



BENNETT'S PATENT MACHINERY FOR BEATING GOLD, SILVER, AND OTHER METAL LEAF.

(Patent dated October 5, 1854.)

Mr. Bennett, gold and silver beater, of Clerkenwell, has patented an arrangement of apparatus for beating out metal leaf, which is intended to produce effects equivalent to those obtained by the hand hammering process that requires great strength and skill. A short account of this machine was given in our number for April 21 (No. 1654), page 379; but the following description, accompanied by the engraving on the preceding page, is intended to furnish a complete account of it.

Fig. 1 is a side elevation, and fig. 2 an end elevation, of a machine constructed in accordance with Mr. Bennett's invention. *a* is the shaft or driving axis, on which are fast and loose pullies, *b*, *b*, which receive motion from a steam engine or other prime mover by means of a band, *c*. There is a cone, *d*, on the axis, *a*, which, by a band, *e*, gives motion to another cone, *f*, on the axis, *g*, and the band, *e*, is caused to shift on the cones, *d* and *f*, by means of a fork, d', which travels on a screw; and there are rods or guides, which prevent the fork revolving with the screw, by means of portions of the boss or nut of the fork, d', sliding thereon; and this arrangement is for the purpose of altering the speed of the hammer as the work progresses, which the attendant inspects from time to time. On one end of the axis, *g*, there is a pulley formed, which, by a band, *h*, passing around it and a pulley, *i*, gives motion to the axis, *j*. Upon the axis, *j*, are two wheels, *k*, *k*, one at either end, having crank pins, to which the lower ends of the connecting rods, *l*, *l*, are attached, their upper ends being connected to the cross head, *m*, which travels in guides, *n*, *n*, formed in the framing. Upon the connecting rods, *l*, *l*, are formed or affixed projections, l', l', which, when the cross head, *m*, is down, pass below the projecting ends, o', o', of the cross head, *o*, of the hammer, *p*, which also travels in the guides, *n*, *n*, of the framing, so that when the cross head, *m*, rises, by the upward movement of the connecting rods, *l*, *l*, the cross head, *o*, and hammer, *p* (fixed thereto), will also be raised by means of the projections, l', l', which are so formed that when the hammer, *p*, and cross head, *o*, have been carried up to the fullest extent that the crank pins admit of, and the connecting rods, *l*, *l*, have begun to descend, the ends, o', o', of the cross head, *o*, slip off the projections, l', l', and the cross head, *o*, and hammer, *p*, being guided, as explained, fall on to the anvil, *q*; but should they not fall fast enough (as would be the case when working rapidly), then the cross head, *m*, would drive them down. The mould, *r*, is caused to change its position on the anvil slightly after every blow of the hammer, *p*, and this movement is obtained by the following means:—There is a small pulley, *s*, on the axis, *j*, which, by a band, *t*, acting on the pulley, *u*, gives motion thereto. There is on the face of the pulley, *u*, a pin or projecting tooth, u', which enters between the pins, v', v', of the wheel, *v*, in such manner that, upon each revolution of the pulley, *u*, the projecting pin or tooth, u', drives the wheel, *v*, on its axis to the extent of one tooth, or one-twelfth of a revolution. Upon the upper surface of the wheel, *v*, and working in bearings attached thereto, is a screw on which is a nut which travels thereon when the screw is turned. At the upper part of the nut is formed an axis on which is a small pulley, shown in fig. 3, and on the same axis is a connecting link, which serves to connect the nut with a metal ring, to which are attached rods which work in guides attached to the anvil, *q*, so that a slow to-and-fro movement of the ring is caused to take place upon the anvil. Within the above-named ring is another which extends upwards a little above the former, the upper portion having a groove formed therein to receive a gut or band, which, by passing around it and the small pulley, is caused to revolve slowly within the outer ring. By these means the mould, *r*, which is within the squared portion of the ring, receives a slight movement after every blow of the hammer, such movement always taking place during the ascent of the hammer, *p*.

ON THE MANUFACTURE OF STEEL.

(*Concluded from page* 462.)

From this description of the process, it will be evident that pig-iron will require a much longer time to decarbonise than the cakes of metal which have been roasted, as already described; and, again, it must be evident that a *purified* and *decarbonised* metal, such as I have proposed, must be the best to secure a good and equal quality to the steel, since the purified metal is more homogeneous than the crude iron.

When, therefore, care has been taken in melting down each portion of metal, and a complete and perfect layer of steel has been obtained after each successive melting, when

the cinder has had due attention, so that it has been neither too thick nor too thin, and the heat of the fire regulated and modified during the progressive stages of the process, then a good result is obtained; a fine-grained steel is produced, which draws under the hammer, and hardens well. However good it may be, it possesses one great defect; it is this. During its manufacture, *iron* is produced along with the steel, and becomes so intimately mixed up with it, that it injures the otherwise good qualities of the steel; the iron becomes, as it were, interlaced throughout the mass, and thus destroys its hardening quality. When any tool or instrument is made from natural steel, without it has been very well refined, it will not receive a *permanent* cutting edge; the iron part of the mass, of course, not being hard, the tool cuts only upon the steel portion; the edge very soon, therefore, becomes destroyed. There is another defect in natural steel, but it is of less importance. When too much carbon has been left, the steel is raw and coarse, and it draws very imperfectly under the hammer; the articles manufactured from such steel often break in hardening; thus it is evident, that in producing the steel, every care, skill, and attention are required at the hands of the workman. These defects very materially affect the commercial value of the steel; the irregular quality secures no guarantee to the consumer that the tools shall be perfect, and, consequently, it is not used for the most important purposes; yet, where the raw steel is refined, it becomes a very useful metal, and is largely used in Westphalia for the manufacture of hardware, scythes, and even swords. It possesses a peculiarity of retaining its steel quality after repeated heating, arising from its carbon being, as it were, incorporated with *each* molecule of the mass. This property renders it very useful for mining and many other purposes.

The raw steel, being so imperfect, is not considered so much an article of commerce with the manufacturer, but it is sold to the steel refiners, who submit it to a process of welding. The raw steel bloom is drawn into bars, one or two inches wide and half an inch thick, or less; a number of these are put together and welded; these bars are then thrown into water, and they are broken in smaller pieces to examine the fracture; those bars which are equally steelified, are mixed together. In manufacturing refined steel, the degree of hardness is selected to suit the kind of article which it is intended to make. A bar, two to three feet long, forms the top and bottom of the bundle, but the inside of the packet is filled with the small pieces of selected steel. This packet is then placed in a hollow fire, and carefully covered from time to time with pounded clay, to form a coat over the metal, and preserve it from the oxidizing influence of the blast. When it is at a full welding heat, it is placed under a hammer, and made as sound and homogeneous as possible; it is again cut, doubled together, and again welded. For very fine articles, the refining is increased by several doublings, but this is not carried at present to so great an extent as formerly, since cast steel is substituted, being in many cases cheaper.

I take the manufacture of puddled steel as next in order, because the product is similar to that of natural steel, that being obtained direct from the crude pig-iron. It is a steel of very recent invention, and its manufacture is carried on entirely in Westphalia. But a few years ago a very small quantity of this steel was produced from *one* work. There are now several large establishments for its manufacture. The produce is becoming considerable, and likely to increase on account of its cheapness.

The object of the operation is similar to that adopted in the making of raw steel, to decarbonise pig-iron down to that point at which it can be treated as steel. The process is this:—About 280 lbs. of pig-iron are charged into a puddling-furnace. As soon as this metal begins to melt, the damper is partly closed, and 12 to 16 shovelfuls of cinder, &c., as it comes from the hammer and rolls, are thrown into the furnace; the whole is then melted down together, and the mass is puddled with great care. The metal having become so far decarbonised as to lose its liquidity, the damper is opened, and 40 lbs. of pig-iron are charged near the fire-bridge of the furnace. This is allowed gradually to melt and mix itself with the metal previously charged, which causes it to boil; a blue flame rises from the surface of the mass, and very shortly the metal stiffens. The damper is again three-quarters shut, and the mass is worked until it becomes waxy. The metal is then collected into balls and hammered into blooms. This steel is very imperfect; too much depends upon the manipulation of the process; it is out of the sight of the workman, and equally from under his control, being continually covered with cinder. Practice has, no doubt, assisted materially in the improvements made in the manufacture of this steel since its introduction, but it is evident that steel produced by such a process can only be serviceable for the commonest purposes, being subject to many serious imperfections. The blooms resulting from the process described are drawn, doubled, and welded precisely in the same manner as charcoal raw steel is refined; yet, such is the acknowledged inferiority of this steel, that whilst charcoal natural steel sells for

£18 per ton, the puddled steel will not command more than £14 per ton, and an equal reduction is made on the refined steel manufactured from puddled steel blooms.

The next process is the Paal method, so called from the name of the works at which the plan is used. These works belong to Prince Schwartzenberg, and are situated near to Murrau, in Styria. The process is based upon the old one of Vanaccio; it consists in plunging iron into a bath of melted metal. The carbon of the metal combines with the iron, and in a very short time converts it into steel. This process was carried further by Vanaccio, who contrived to add wrought iron to the metal until he had decarbonised it sufficiently; this was found to produce a steel, but unfit for general use. That produced by plunging iron into metal, was found to be very hard steel on the outside, but iron within; while that produced by adding iron to the metal was found too brittle to be drawn. The Paal method, however, as I saw it used at these works, is a decided improvement in the manufacture of refined natural steel. They produce natural steel at the prince's various works, and bring it to Paal to be refined. The packets, as already described in the refinement of natural steel, are welded and drawn to a bar; whilst hot they are plunged into a bath of metal for a few minutes, by which the iron contained in the raw steel becomes carbonized, and thus a more regular steel is obtained than that produced by the common process. The operation requires great care, for if the bars of steel be left in the metal too long, they are more or less destroyed, or perhaps entirely melted. It commands a little higher price in the market, and is chiefly consumed by the home manufacturers, excepting a portion which is exported to Russia.

I have now described the manufacture of steel by various processes, in all of which the carbon is derived from the metal itself, and in which the whole of the molecules of the metal may be said to be equally charged; they contain the necessary amount of carbon, or steelifying principle, within themselves, and to this may be attributed the reason why, after repeated heating and hammering, the steel never loses its property of hardening. On this account, natural steel is used almost exclusively by the Mexican and South American miners for their tools.

I shall now turn to the second mode of producing steel, by introducing carbon into iron to such an extent as may be needful for the various purposes to which it is to be applied.

In explaining the theory and practice of manufacturing natural steel, I have shown that the object is to prevent the mass from becoming iron, the process being arrested at that point where the metal has lost so much of its carbon that the *remainder* is necessary for it to possess as a steel.

The process of converting iron into steel by cementation is the reverse of the process already described. The iron to be converted is placed in a furnace stratified with carbonaceous matter, and on heat being applied, the iron absorbs the carbon, and a new compound is thus formed.

When this process was discovered, is not known. At a very early period charcoal was found to harden iron, and make it a sharper cutting instrument; it seems probable that, from the hardening of small objects, bars of iron were afterwards submitted to the same process. To Reamur certainly belongs the merit of first bringing the process of conversion to any degree of perfection. His work contains a vast amount of information upon the theory of cementation; and although his investigations are in many instances not borne out by the practice of the present day, yet the *first* principles laid down by him are now the guide of the converter; our furnaces are much larger than those used by Reamur, and they are built so as to produce a more uniform and economical result; they give, however, precisely the same results which he obtained in his small ones.

A converting furnace consists simply of two troughs, built of fire-brick, 12 feet long, 3 feet wide, and 3 feet deep; the fire-room is placed between them, and the whole covered by an arched vault, so that the heat may pass entirely around these troughs, and distribute itself equally. The bar iron is placed within these troughs, stratum superstratum along with charcoal, which is broken to the size of beans. When the troughs are full, they are covered with sand or loam, which partially vitrifies and cakes together as the heat of the furnace increases, and thus, by hermetically sealing the top, the air is excluded. This furnace being charged with about 20 tons of iron, the fire is lighted, and in the course of 60 to 70 hours the iron will have become fully heated; *at this point the conversion commences.* The pores of the iron being opened by heat, the carbon is gradually absorbed by the mass of the bar, but the *carbonisation* or conversion is effected, as it were, in layers. To explain the theory in the clearest manner, let me suppose a bar to be composed of a number of laminæ—the combination of the carbon with the iron is first effected on the surface, and gradually extends from one lamina to another, until the whole is carbonised. To effect this complete carbonisation, the iron requires to be kept at a considerable uniform heat for a length of time. Thin bars of iron are much

sooner converted than thick ones. Reamur states, in his experiments, that if a bar of iron 3-16ths of an inch thick is converted in 6 hours, a bar 7-16ths of an inch would require 36 hours to attain the same degree of hardness. The carbon introduces itself *successively*, the first lamina or surface of a bar combining with a portion of the carbon with which it is in contact, gives a portion of the carbon to the second lamina, at the same time taking up a fresh quantity of carbon from the charcoal; these successive combinations are continued until the whole thickness is converted; from which theory it is evident that, from the exterior to the centre, the dose of carbon becomes proportionately less. Steel so produced cannot be said to be perfect; it possesses in some degree the defect of natural steel, being more carbonised on the surface than at the centre of the bar. From this theory we perceive that steel made by cementation is different in its character from that produced directly from crude metal. In conversion the carbon is made successively to penetrate to the centre of the bar, whilst in the production of natural steel, the molecules of metal which compose the mass are *per se* charged with a certain per centage of carbon necessary for their steelification; not imbibed, but obtained by the decarbonisation of the crude iron down to a point requisite to produce steel.

During the process of cementation, the introduction of the carbon disintegrates the molecules of the metal, and in the harder steel produces a distinct crystallisation of a white silvery colour. Wherever the iron is unsound or imperfectly manufactured, the surface of the steel becomes covered with blisters thrown up by the dilatation of the metal and introduction of carbon between those laminæ which are imperfectly melted. Reamur and others have attributed this phenomena to the presence of sulphur, various salts, or zinc, which dilate the metal; but this is incorrect, because we find that a bar of cast steel which is homogeneous and perfectly free from internal imperfections never blisters, for although it receives the highest dose of carbon in the furnace, yet the surface is perfectly smooth. From this it is evident that the blisters are occasioned by imperfections in the iron. Iron increases, both in length and weight, during conversion. Hard iron increases *less* than soft. The augmentation in weight may be said to be $\frac{1}{900}$, and in length $\frac{1}{120}$ on an average.

The operation of conversion is extremely simple in its manipulation; nevertheless, it requires great care, and a long as well as a varied experience, to enable a manager to produce every kind or temper required by consumers. Considerable knowledge is required to ascertain the nature of the irons to be converted, because all irons do not convert equally well under the same circumstances; some require a different treatment from others, and, again, one iron may require to be converted at a different degree of heat from another. The furnace must have continual care, and be kept air-tight, so that the steel, when carbonised, may not again become oxidised. Generally speaking, in working converting furnaces, but little attention is paid to the theory of producing steel, which I have endeavoured to explain. It is known amongst steel-makers, that if iron be brought in contact with carbon, and if heat be applied, it will become steel. This is the knowledge gleaned up by workmen, and I may add, by too many owners of converting furnaces. The inconvenience arising from a want of care and knowledge of the peculiar state of the iron *during* its conversion, sometimes occasions great disappointment and loss. The success usually attained by workmen may, however, be attributable to an everyday attention to one object, thus gaining their knowledge from experience alone; good, I admit, in a workman, but this should not satisfy the principal or manager of a steel work. It is, perhaps, not needful that he should be a man of science, but I consider it the duty, as it certainly is the interest, of every owner of such works, not only to satisfy himself, but to be able to convince the minds of others, that he is fully conversant with the cause and effect of every operation in his business, and although a knowledge of chemistry may throw much light upon his operation, it is also necessary that he should possess a varied experience in conjunction with it, before he can pretend to produce steel of such superior and uniform quality as the arts require. The conversion, or carbonisation of the iron, is the foundation of steel making, and, as such, may be considered as the first step in its manufacture. Before bar steel is used for manufacturing purposes, it has to be heated, and hammered or rolled. Its principal uses are for files, agricultural implements, spades, shovels, wire, &c., and in very large quantities for coach springs.

Bar steel is also used for manufacturing shear steel. It is heated, drawn to lengths 3 feet long, then subjected to a welding heat, and some six or eight bars are welded together precisely as described in the refinement of natural steel; this is called single shear. It is further refined by doubling the bar, and submitting it to a second welding and hammering; the result is a clearer and more homogeneous steel. During the last seven years the manufacture of this steel has been limited, mechanics preferring a soft

cast steel, which is much superior when properly manufactured, and which can be very easily welded to iron.

The price of bar steel varies according to the price of the iron from which it is made, but, as a general average, its price in commerce may be taken at £5 per ton beyond the price of the iron from which it is made. Bar steel produced for the better irons is usually dearer than the commoner kind, on account of their scarcity.

Shear steel in ordinary size sells at £60 per ton nett.

Coach-spring steel from foreign iron, £22 per ton nett.

Coach-spring steel from English iron, £18 per ton nett.

These may be taken as approximate prices in 1854-5.

From the outline which I have given of the processes by which various steels are manufactured, it will be seen that there are in each great defects, want of uniformity, temper, or clearness of surface, unfitting them for many useful purposes. To obviate these defects, both bar converted and also raw steel are *melted*, by which the metal is freed from any deleterious matter which the iron might have contained; a uniform and homogeneous texture is obtained, whilst an equality in temper or degree of hardness is secured; besides which the surface is capable of receiving a high, clear, and beautiful polish—qualities which the other steels I have described do not possess. The first steel which may be called cast steel is the celebrated wootz of India; it is produced by mixing rich iron ore with charcoal in small cups or crucibles. These are placed in a furnace, and a high heat is given by a blast. After a certain time this ore melts and receives a dose of carbon from the leaves and charcoal charged with it. The result is a small lump of metal with a radiated surface about the size of a small apple cut in two; it is very difficult to work; nevertheless, swords and other steel implements are manufactured from it in the east; it is not found in England as an article of commerce. The melting of bar steel was first practically carried out by Mr. Huntsman, of Attercliffe, near Sheffield, whose son yet carries on its manufacture, for which he enjoys a very high celebrity, by making use of the best materials, and insisting upon the most careful manipulation of his steel in every process. The manufacture of cast steel is in itself a very simple process. Bar steel is broken into small pieces, which are put into a crucible, and are melted in a furnace about 18 inches square and 3 feet deep. The crucible is placed on a stand 8 inches thick, which is placed on the grate-bars of the furnace. Coke is used as fuel, and an intense heat is obtained by having a chimney about 40 feet high. Although a very intense white heat is obtained, yet it requires 3½ hours to perfectly melt 30lbs. of bar steel. When the steel is completely fluid, the crucible is drawn from the furnace, and the steel is poured into a cast-iron mould. The result is, an ingot of steel, which is subsequently heated and hammered, or rolled, according to the want of the manufacturers. Although I stated that the melting of cast-steel is a simple process, yet, on the other hand, the manufacture of cast steel suitable for the *various wants* of those who consume it requires an extensive knowledge; a person who is capable of successfully conducting a manufactory, must make himself master of the treatment, to which the steel in manufactures will be submitted by every person who consumes it. Cast steel is not only made of many degrees of hardness, but it is also made of different qualities; a steel maker has, therefore, to combine a very intimate knowledge of the exact intrinsic quality of the iron he uses, or that produced by a mixture of two or three kinds together; he has to secure as complete and as equal a degree of carbonisation as possible, which can only be attained by possessing a perfect practical and theoretical knowledge of the process of converting; he has to know that the steel he uses is equal in hardness, in which, without much practice he may easily be deceived; he must give his own instruction for its being carefully melted, and he must examine its fracture by breaking off the end of each ingot, and exercise his judgment whether or not proper care has been taken; besides all this knowledge and care, a steel maker has to adapt the *capabilities* of his steel to the *wants* and *requirements* of the consumer. There are a vast variety of defects in steel as usually manufactured; but there are a far greater number of instances in which steel is *not adapted* for the manufacture of the article for which it was expressly made. Cast steel may be manufactured for planing, boring, or turning tools; its defects may be, that the tools when made crack in the process of hardening, or that the tool whilst exceedingly strong in one part, will be found in another part utterly useless.

ON A NEW MANUFACTURE OF COMPOUND METALLIC RODS AND BARS.

A paper on the above subject was recently read at the Institution of Mechanical Engineers, Birmingham, by Mr. E. J. Payne, of that place. The following is an abstract of the author's remarks:

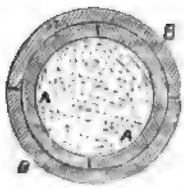
At a time like the present, when the high

price of iron is of such importance to the consumers of rods and bars, descriptions of iron very extensively employed in many of the staple trades of this neighbourhood, there may be some interest attached to the results of some experiments lately made with the view of producing an economical substitute for solid iron rods and bars, such as are mainly employed in the manufacture of fences, railing, hurdles, metallic bedsteads, and many other purposes.

The specimens exhibited, though somewhat crude, serve to elucidate the principle of the process.

They are small samples cut from lengths of rods and bars rolled in the following manner:—Two skelps of iron, A A, of the requisite weight, previously ascertained, are placed together to form a cylinder; and two similar skelps, B B, but of a somewhat larger size, are laid round this cylinder in such a manner as to break or cross the joints, as shown in fig. 1. The whole is then

Fig. 1.



bound together with iron hoops or strong wire, and a short piece of solid metal driven into one end of this cylinder, which is then filled with sand, earth, or ashes, and well and tightly rammed and dried, after which the open end is plugged in the same way as the opposite one had been.

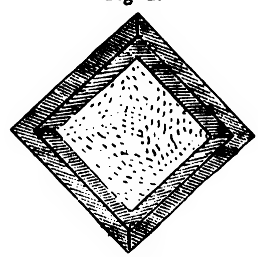
The billet thus charged is put in the furnace, and when at a sufficient heat is removed to the rolls, and rolled out precisely as solid iron, the sand core being reduced in very nearly the same proportion as the iron. The exactness of this proportion depends entirely upon the thorough ramming of the core in the billet; for if the sand be loose, it follows that by the compression of the core in rolling, the iron makes up the deficiency in diameter, and a shorter length of rod than the billet was calculated to make is the result. Some of the specimens show this result clearly. The area of sand in one of the billets shown, was one of iron to one of sand, or half sand, but after rolling and reducing it, it was found to have assumed the proportion of one and a half iron to one of sand, or only two-fifths sand.

It will be perceived by the specimens, that the sand during the process has become, by the heat and great pressure, a semi-vitreous body of exceeding hardness, so close in its texture as to bear a polish; and this appears to add (in conjunction with the tubular form of the metallic portion of the rod) very great additional strength;—for upon testing one of the specimens about five-eighths of an inch in diameter against a length of solid iron rod of the same diameter, by placing both upon benches, and suspending weights from the centre, the compound rod was found to sustain without deflection a weight that nearly doubled up the solid rod.

Some of the rods produced have been made from billets turned up into a cylinder from a flat skelp in gun-barrel rolls, and one from the breech end of a twisted gun-barrel; this was of course done merely as an experiment, as it appeared to be the worst description of tube for the purpose; the core, however, proved as sound as any of the rest. Generally speaking, the form of billet first described appears to be the best, and it is certainly the least expensive.

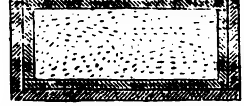
Thus far the manufacture has been described of round rods. For square rods and flat bars, the same description of billet is employed, varying only in section; thus, for a square rod, a billet of the section shown in fig. 2, composed of two skelps of

Fig. 2.



a V form will be used; and for a flat bar, the section in fig. 3, made of skelps of angle iron would be employed, the operation of

Fig. 3.



rolling being identical with that now in use for solid iron.

It now remains to show the results attained by these experiments, as to the saving of cost in the manufactured rod. The most complete estimate in the possession of the writer is one furnished from the works in South Wales, where the greater portion of these experiments have been made, which is the following:

Assuming the present price of the rolled skelps of the sections shown, to be

	£	s.	d.	
	9	10	0	per ton,
add	2	10	0	per ton, cost of making, ramming, and plugging the billets, including cost of sand.
add	1	0	0	per ton for contingencies and waste.

£13 0 0 Total cost of working up one ton of iron into a length equivalent to that which would be produced from two tons of solid iron; giving the price of the rods or bars containing half sand, 6*l*. 10*s*. per ton measurement, or a saving of about 3*l*. for the same length of rod or bar. But it should be remembered that these experiments have been confined to the production of rods not exceeding one inch in diameter, and that as the diameter of the rod increases, a considerably greater proportion of sand than one-half can be introduced: consequently, a ton of iron may be made to produce more than two tons measurement of the larger rods or bars. This estimate of the saving on an average of all marketable sizes, would therefore be rather within the mark than otherwise.

Certain samples of railway rails upon the table were also rolled at the Cwm Avon Works in South Wales, with a view of testing the applicability of the invention to effect a saving of metal in this branch of manufacture. Also certain piles were made in the usual manner, with upper and lower plates of No. 2 iron, the remainder being puddled bars, and having a hollow in the centre, for the reception of the core; the sand was in this case first rammed in a core box, made of plate iron, ¼ inch thick. In one of these piles the core was 4½ inches, the other, 3½ inches square, but the ends were left unplugged; the result of the rolling showed that the sand assumed very much the form of the rail, but from the omission of the plugging, the area of the section of sand in the rails is not nearly so great in proportion as that of the one introduced in the pile.

Some samples of small copper tubes, made on the same principle as the iron rods, are also shown among the specimens, the only difference in their manufacture being, that the billets were in this case drawn cold; consequently, the sand, not being vitrified, was readily removed afterwards from the bar, leaving it an open tube; but these may be more easily made by charging the billets (the cylinders for which are cast as shown by the specimen exhibited) either with pure silica or plaster of Paris, neither of which will vitrify, and then rolling them hot in the same manner as the iron rods. This kind of core undergoing no change by the action of the fire, may be bored out with ease.

Further experiments are now being made, with the endeavour to produce rods having a mere skin of iron on the strong core, the result of which the writer will be happy to communicate on a future occasion.

CAPTAIN NORTON'S RECENT INVENTIONS.

On Friday last, at the United Service Institution, the Honourable Captain Murray, R.N., in the chair, Captain Norton explained the nature of his recent inventions, exhibiting models, the more clearly to illustrate them. The following is a summary, with which we have been furnished, of the inventions brought before the Institution.

1. Fog-alarm signal, to be placed on the rails. This model is merely stuffed with paper: the unfilled varnished waterproof papers show the stages of formation. It is evident that it cannot *rust* or become *damp*, neither is there anything to *fly* and cause injury.

2. Whistling bolt, to be shot by the guard of a train, high over the head of the engine-driver, or on one side of him. The cartridge is attached to the inner end of the bolt, and is fired without previous opening.

3. Fire-ball bolt. The quick-match is placed between the shaft and the ball; the latter of course can be made to produce either fire or flame.

4. Explosive percussion-bolt signal. The igniter is the *last* inserted; and the bolt falling on grass or soft clay, is sure to explode by the fracture and consequent friction of the glass-tube igniter.

5. Elastic expanding sabot. Its base is fortified by a circular piece of sole, or stout leather, glued on with gutta percha, or other cement. With this sabot *iron* shot may be fired from a rifle, or other gun, without injury to the rifle or bore of the gun.

6. Cartridge—that does not require to be opened previous to or in the act of loading: it can be drawn when required *entire*, without losing any portion of the powder, and is peculiarly well adapted to Sharp's breech-loading rifle, as it does not require

to be *cut* by the action of the closing lever, as his present cartridge does.

7. Implement for firing cannon, without a vent or touch-hole. It is easily fitted on at the mouth of the gun, and the firing of the gun cannot derange it.

8. Shot or shell, made of pressed clay, artificial stone, or glass, for artillery. It will be efficient against all but stone walls; the application of the elastic-sabot *cushions* it in its passage through the gun, and prevents the palpitations that might otherwise fracture it.

9. Frictional exploding signal, that may be thrown from the hand, and caused to explode at the end of a cord high in the air. It can be used to warn a train *following*, not to run into a train brought to a stand by an accident, as in the melancholy case near Straffen.

10. Glass-tube igniter. When charged with percussion-powder, or lucifer composition, the ends are closed with cork, glued with liquid glue.

11. Sabot, made of pressed leather, so as to fit on the lower end of an elongated shot or spherical ball.

12. Improved cordage, so as to give greater strength to the strands forming the rope, cord, or band; the strands are cemented together by a solution of gutta percha, with a slight or no twist.

13. Rifle arrow, or bolt, adapted to Sharp's American breech-loading rifle. This has been shot to the distance of nine hundred yards; the cartridge may be attached to it, so as to lie in the barrel without cutting off the end and *spilling* some of the powder over the jointure of the breech, as is the result with Mr. Sharpe's cartridge, which is attached to his shot. This bolt is peculiarly efficient for vertical fire, to dislodge an enemy from behind strong buildings, ramparts, or other cover.

14. A shell, with a frictional igniting cord attached close to its *short* fuse, to roll down a glacis or other sloping ground, and explode among assailing troops at the end of the cord by the strain of the momentum.

15. A *safe* means for forming percussion shells for cannon. This shell may be let fall, *point foremost*, from the topmast on the deck of a man-of-war, and it will not explode; but if afterwards, without any alteration, it is allowed to fall from the same height into a tub of sand or clay, it will explode: the reason is, that the percussion appliance being *below* the orifice in the shell, it is not *pressed* upon in the first instance, but in the second is.

16. A brass tube, to demonstrate the principle of his improved cartridge. This is done by putting a little gun-cotton into a small piece of tough paper, such as cartridge paper, and then inserting the paper into the tube, keeping the cotton-charged end of the paper about the eighth of an inch apart from the end of the tube, then applying a heated poker to the cotton-end of the tube, but without coming in contact with the paper, when the gun-cotton will explode without *bursting* or soiling the paper.

17. Rifle fire-shot, or spinster. This shot, of the cylindro-conoidal form, and weighing about two ounces and a quarter, was shot to the distance of *eighteen hundred* yards, from a rifle of the eleven calibre, the charge of sporting powder, about five drachms, and the elevation about thirty degrees, so as to give the longest range.

18. A model of the form of the shot that should be used from a two-groove rifle cannon. It is the same which is described by a diagram, No. 12, in his pamphlet on "Projectiles;" the punch formed head only to be made conoidal.

19. A case representing his improved manner of forming drains in land, by *round* well-burnt clay-balls, about four inches in diameter. These, as they can only touch one another at the *points*, will allow a free passage for percolating of the water.

20. A fuse-case, turned from artificial wood, made by hydraulic pressure from prepared saw-dust.

21. *Concussion*-fuse for shells of the largest size. A select committee of Artillery officers, at Woolwich, about nine years ago, reported *officially*, that it was "simple, safe, and efficacious, being well adapted for horizontal-fire at high velocities."—See fig. 7, in his pamphlet on "Projectiles."

22. An instrument for compressing sabots made of leather, cork, tow, or other matter, into the required form.

The whole of these models will be permanently exhibited at the Crystal Palace, the Polytechnic Institution, and the Panopticon.

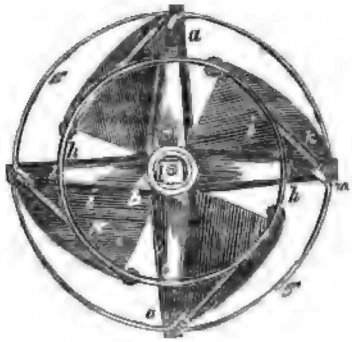
PALMER'S PATENT PROPELLER.

Mr. Palmer, of Southampton, patented on the 11th of September last, an invention which, according to his specification, "consists in so constructing the frames to which propellers are attached, that the blades or propellers, or any of them, may be removed without difficulty, and also offers facilities for applying more or less blades or propellers as required." "For this purpose," continues the specification, "the radial stays are formed with grooves, or grooves are applied to them, and the blades or propellers being formed of a portion of a circle, are attached by sliding into these radial grooves, and fastened therein by bolts or

rivets."—See *Mech. Mag.* for March 31, (No. 1651), p. 305.

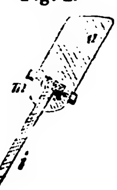
Fig. 1 is a front view of a propeller, arranged according to this invention. *a, a,*

Fig. 1.



are four arms, which are attached to an inner boss, *b*, and *c, c,* are four other arms which are attached to the boss, *d*. At the centres of the bosses, *b* and *d*, there are square holes, through which the square ends of the hollow axis, *e*, pass, so as to connect the parts together; the propeller shaft passes through the hollow axis, and is keyed or otherwise fastened thereto. *g, g,* are curved stays between the arms, *a, a,* and *h, h,* are similar stays between the arms, *c, c; i, i,* are the four propelling blades, which the inventor prefers to set on the shaft at an angle of 45 degrees, at which angle the arms, *a, a,* and *c, c,* are also set on the bosses, *b* and *d*. The blades, *i, i,* are supported between the bars, *k, k;* these bars are connected at one end to the arms, *a, a,* and at the other end to the curved stays, *h, h;* between the arms, *c, c, l, l,* are cross-bars or stays between the arms, *a, a, c, c.* Fig. 2 is a section through

Fig. 2.



one of the arms, *a*, showing the manner in which the blades, *i, i,* slide in grooves in the said arms, so that they can easily be removed when required for sailing, or when it is desired to use only two blades; *m*, is a bolt by which the blade is fixed in the arm.

In writing to the ***Hampshire Advertiser*** respecting this propeller Mr. Palmer says:

"With all due respect to marine engineers, I am desirous of calling your particular attention to this invention, which will work in the place of ordinary screws. It is of an extremely simple construction, being formed by placing two light wheels at the desired distance apart, between which their plates, forming portions of the circle of the desired size of the propeller, slide into position, and which take the water when revolving at an angle of 45 degrees.

"These propellers possess far more propelling power and mechanical strength than any other in use of the same diameter, and are consequently well suited for vessels of light draft; the rings prevent the possibility of their getting foul of any sunken rope or chain from any vessel in a crowded river. In appearance they much resemble a first-rate smoke-jack with four blades, and will readily revolve in a slight current of water (or air), which is of great importance to the sailing of the ships when not required as a propeller.

"The size of the propeller is to be governed by the tonnage of the vessel and the actual working horse-power of the steam engine; the same described figure suits all speeds and all powers of the steam engine. That you may more clearly perceive the advantages to be gained by this simple invention, I give you the result of a day's work with a common screw, and also of a day's work with a propeller of the same diameter.

"***Average of runs from pier to pier with a screw steam boat.***

"Three-fan casting, a common screw, 23 minutes, 179 revolutions per minute.

"Four-blade propeller, same diameter, 17 minutes, 108 revolutions per minute.

"(Same weights on the safety-valves in both instances.)

"The four-blade propeller appeared to reduce the work in the engine-room to a considerable extent; that is, in firing, feeding the boiler, and oiling the machinery, &c."

MR. J. SCOTT RUSSELL ON SHIP CONSTRUCTION.

During a discussion which took place at the Society of Arts, on Wednesday, the 16th inst., after the reading of a paper by Mr. Charles Atherton, chief engineer of Woolwich Dockyard, on Steam Ship Capability, Mr. J. Scott Russell made some very important observations, to the accuracy of which, with respect both to the mercantile and royal services, we can ourselves bear unqualified testimony.—Investigations of this nature, he said, were of the utmost im-

portance, because many might fancy it was the ship builder who controlled the design of a ship, but practically it was not so, but the owner of the ship who dictated her form. A builder was generally trammelled by conditions and limitations, that left him little choice, except to suit the preconceived notions of his customers; and therefore, unless the general public were enlightened, unless shipowners were enlightened, unless they took an interest in a good ship, in a handsome ship, with a good set of engines in her, and became critics of ship-building, they would not have that stimulus applied to the owners of ships which was the sole means of permitting the builders, or, if they liked it, of compelling the builders, to obtain the best possible results. Therefore such discussions as this were highly important. He believed it was the want of a general diffusion of knowledge on this subject that led to such dreadful blunders, not in the Royal Navy alone, but wherever a number of people had to do something for which no one was responsible. He would make one observation in reply to the practical remarks which had fallen from the noble chairman (the Earl of Hardwicke) at the beginning of the meeting. He was sure the meeting would duly appreciate the spirit in which those remarks were made; because, many of them being practical men, and all of them patriotic Englishmen, there was at this moment no conviction which weighed more deeply upon their minds than this—*Here are our practical men of business earnestly longing to do something for the assistance of the country in its present difficulties, and we could not do it for want of an organization which would enable us to give the government the entire benefit of all our resources and our best services.* They all longed to see some practical way in which some good could be done, in order to turn all the mechanical powers of England into the service of the government at this moment; and if that were done, it would sweep away the resistance of any other country to us. But here was the difficulty, and he was afraid his lordship could not help them out of it. There were no people who knew better than the servants of the government this fact—that they could not, even when servants of the government, get the proper scope for their energy and talents; and the reason was this—"THE WANT OF PERSONAL RESPONSIBILITY." There were many eminent men present, of high official standing in the government, and he believed he gave expression to their private sentiments on this subject. He would venture to say, if the capable men in the service of the government were placed in their positions with their hands so free and unfettered that each man were permitted to do that which he knew he was most capable of doing for the service of the government, in the manner which he knew to be most effective for the public service, and were charged with the entire and personal responsibility of his own work, a rapid practical amelioration would take place in the execution of public business. The construction of a steamship for the government, if it were the sole work of one man, whose name was openly attached to it as solely responsible for its success, would run a very fair chance of success; but wherever such works were done by boards instead of by individuals, the difficulties in the way of success were nearly insuperable, because personal responsibility was at an end. Instead of this, it was "an office" that did the work, and not the individual. Out came the office plan—the office plan was built. If it succeeded, there were twenty people ready to claim the authorship of it, but if it failed pity the poor gentleman who originally drew it! For success in steam navigation, the name of one individual should be identified with each ship, as personally responsible for her, from the laying of the keel to her final repose in the breaker's yard, and with personal responsibility you would have good ships. If it were possible for the government of this country to make one individual publicly responsible for the success of every separate piece of work done, to attach the name of one individual who really had the doing of that thing to his work in so unmistakable a manner that he should have all the credit and all the discredit of doing that thing well or ill,—if it were possible that each working head of every department, down to the lowest, were personally responsible for all those below him, and these in turn responsible only to those immediately over them, then public works might be managed much in the same way as private works were conducted, and with equally good results. He feared, however, that our system of parliamentary government was hardly compatible with such a system of extensive personal responsibility. These remarks, perhaps somewhat foreign to the subject, were what he could offer in reply to the wish expressed by the noble chairman, that the services of such societies of men as the present might be rendered available to the assistance of certain departments of government. He begged to assure his lordship of the earnest desire of every man in that meeting to place any talents or powers he might possess at the disposal of government, for the great purpose of the defence of the honour of the country in which, probably, most of them felt even a deeper interest at this moment than in any of their private undertakings.

CLIFFORD'S PATENT METHOD OF LOWERING SHIPS' BOATS.

Mr. Clifford, the patentee of certain improvements in apparatus for lowering boats evenly, for preventing their filling with water, and for releasing them effectually from the vessel to which they belong in times of emergency, which were described, *Mechanics' Magazine*, vol. lix., p. 334, has recently written to the *Times* as follows:—"In the winter of 1851 the Parliamentary committee appointed to inquire into the cause of the loss of the *Amazon*, reported, among other results of their investigations, that 'the means of lowering boats evenly and of readily disengaging the tackles, together with plugs, which are self-acting, are *desiderata* wanting throughout the naval service,' and they go on to say, 'that it may be expected some useful means of supplying these defects will be devised.' But the spring of 1855 shows everything the same. The *Duke of Wellington*, Her Majesty's line-of-battle ship, steams out of Portsmouth or Spithead on her maiden trial trip, well found in every appliance for the destruction of the human species that naval skill can prompt, but a man falls overboard from her yards, and before a boat can be lowered he is gone. The emigrant ship *John* founders, and her boatswain 'considers it lucky that her boats have been smashed, as otherwise all persons on board would in all probability have been drowned.' The boats were useless; and why? The plain answer is, that as they seldom can be lowered without accident when a vessel is going through the water, the sailor has learnt to look on them as worse than useless, especially if affrighted passengers are to be their occupants during the process. He makes a pigsty of them, and well he may, for had he not they would only be his coffin when he trusted to them for his salvation. Your own records of the loss of the *Amazon*, the *Birkenhead*, or *Victoria* will bear me out in this. In each of these instances the ships were well supplied with boats, but how many of them reached the water safely? Of the *Amazon*, two (of the smallest); of the *Birkenhead*, the same number; and of the *Victoria*, but one!—the two latter vessels striking within a short distance of the shore, and in a calm. Not less than 600 people perished, because the boats could not be properly lowered and in sufficient time, by the loss of these three ships. Now, have any means been taken to remedy this national disgrace to our nautical skill beyond the timely urgings of your powerful appeals? Boats may be carried till the ship's deck is covered with them; but to what purpose, if the signal for lowering is the signal for accident? Three years' careful consideration of the subject, and practical experiment, have enabled me to overcome the evils hitherto looked upon as insurmountable, and the report of a number of nautical and scientific men, which I enclose, leaves me little to say in its behalf. By my plan one man only in the boat, without any other assistance whatever, by simply paying off a rope, unlashes and frees the boat from the ship's gripes, lowers her levelly into the water, and entirely disengages her at will, whatever her weight or the number of her crew; and it is impossible for her to cant or turn over in her descent, or for a rope to tangle or catch in its passage through the block which I use. So simple and effectual is the system, that I now unhesitatingly challenge any six sailors by the present system of blocks, tackles, and hooks to a trial against me—a landsman, singlehanded—to lower and entirely free from the ship a boat laden with any freight varying in weight from 10 cwt. to four tons, either from davits, or from a single yard or spar, and from any height, with a vessel going at any speed. There are others who have plans and inventions besides myself, but let all these be subjected to the practical test I call for. Let emulation stimulate to further exertion, and experiment and success must follow. The sailor may then, knowing that he has a certain means of escape from his ship when she will no longer hold together, stay by her to the last, and not, as in the case of the *John*, leave her at the first chance, when alone there is a probability of his doing so in safety. The harrowing recitals of shipwrecks will then lose some of their horrors, and rescued humanity will turn to you as the advocate that pleaded its helpless cause."

As Mr. Clifford does not, in the above important letter, describe the details of his invention, we subjoin the following description, which we have already published, as above stated, and which is taken from his specification filed at the office of the Commissioners of Patents.

"In this invention a barrel is placed under one of the seats, having two holes therein. Three ropes are employed; one of which, being passed through the barrel and firmly secured therein, is wound round it. The other two ropes are fixed to the ordinary davits or apparatus at the ship's side; they pass respectively through two blocks (each having three sheaves, which may or may not rotate on axes), and then enter one hole in the barrel in opposite directions; they are otherwise left unfastened. The two blocks are fixed to diagonal ropes, which are inside, fast on either side of the

boat. By this arrangement, when the first rope is pulled the barrel rotates and winds up the other two ropes to any required elevation. The first rope is then made fast to hitch-pins, or otherwise, in the boat. The lowering is effected by paying off the first-mentioned rope, thus allowing the barrel to rotate; and as soon as the boat has descended and moved to a distance equal to the length of the two ropes, they will be drawn out of the holes and through the blocks, and the boat will be free."

THE WHITTINGTON CLUB AND METROPOLITAN ATHENÆUM.

THE recent destruction by fire of the premises occupied by the above Institution has, we very much regret to find, so far jeopardised its existence, that an earnest effort must be made by its friends and supporters in order to save it from dissolution.

The sum for which the building was insured, when destroyed, falls £3,000 short of that which is necessary for its re-erection; and as the surrender of the lease held by the Club would be attended by numerous disadvantages, and probably lead to the immediate dispersion of its members, the Committee have determined that an endeavour shall be made to raise the sum required for completing the rebuilding and decoration of the premises in Arundel-street. They have accordingly called upon the members and the public for a Building Fund Loan, to be raised in 3,000 shares of £1 each, to be paid in instalments at the rate of two shillings per share, per month. Shares may be obtained on application at the Office of the Club, 210, Strand.

We sincerely commend the matter to the attention of our readers, as we should greatly deplore the extinction of so useful and valuable an Institution as the Whittington Club, which offers to the young men of London advantages nowhere else to be obtained.

THE BOILER EXPLOSION AT CRAWSHAW BOOTH.

To the Editor of the Mechanics' Magazine.

SIR,—We have now before us the evidence on the cause of the boiler explosion, at Crawshaw Booth, near Rawtenstall; and also two reports, one from Mr. Roberts, the other from Mr. Longridge, the chief inspector of boilers for the Association. Judging from the evidence of the various witnesses examined, it would appear, that previous to the day on which the explosion occurred, all possible care was exercised in the working of the boiler, no extreme pressure having been used. On the day of explosion, however, the engine tenter placed an extra weight upon the safety valve lever; it is not clearly proved for what purpose, nor to what extent the boiler became loaded thereby. No doubt the engineer was in ignorance as to the effect it would produce; nevertheless, such conduct cannot be too severely censured. No additional weight ought to be added to any boiler, without first consulting an engineer fully competent to say whether the boiler would bear such extra strain. Mr. Roberts says, in his report, that the explosion took place in consequence of a rupture in the right-hand furnace tube, or flue, there being two such furnace flues, 3 feet 3 inches diameter, and three eighths of an inch thick, extending from one end of the boiler to the other, the same being 27 feet long and 8 feet 6 inches in diameter. He also says that the material was of fair average quality, and the workmanship good; the boiler was also well stayed. In his calculations he goes on to prove that the boiler was capable of sustaining a pressure of 100 lbs. on the square inch, and that he would have no hesitation in sitting upon it, while a pressure of 60 lbs. was used. Now, Sir, with this evidence before us, and the want of proof as to the extra weight used by the engineer, does it not appear an extraordinary case? Taking it for granted that the engineman added double the weight, still this was not over Mr. Roberts's calculated estimate as to the sustaining power; we must, therefore, come to the conclusion that the depression in the flue aforesaid was sufficient to destroy the strength of it, in the absence of any correct data to determine what pressure such a tube would really bear. A great deal has been said and written, from time to time, about the most correct form for such flues or furnace tubes; and all are now aware that the (perfect) circular form is the best adapted to resist pressure: but let me ask, are there any such flues or tubes made in the ordinary manner, when the plates overlap each other for the rivet joint? If they cannot be made in a perfect form, a due allowance ought to be made for such. How very rarely do we hear of a locomotive fire-box giving way, and yet who will say it is the best of all forms?

We will now turn to Mr. Longridge's report on the matter, and see what his views are. He says, "From the manager's evidence, it would appear that there was abundance of water in the boiler." Again he says, "Without, however, supposing any deficiency of water, there appears to me to be quite sufficient cause for the accident in the great height of the external flues, and the incrustation on the plates; for it is evi-

dent that the heat in the upper part of these flues, which are so much (18 inches) above the centre of the boiler, would be conducted to the *steam* instead of the water." Now, let us examine how far this statement would bear upon facts. In the first place, we will allow the flue to have been 18 inches above the centre of the boiler; but this does not prove that it was the same height above the surface of the water in the boiler. Again, the heat and products of combustion having passed along the whole length of the boiler (27 feet) through the tubes and round the ends, would not produce any sensible change in the temperature of the steam. We will suppose the temperature of the steam, at a pressure of 42 lbs. on the square inch, to be about 272°; it would then require this temperature to be increased to 400°, to agree with Mr. Longridge's views; and this difference to be produced by the action of the heat in the side flues, which is not possible. We will refer again to the report, when he says, "While the engine is at rest, the valves being all closed, there would be little circulation in the water; and the steam (as stated above) would be gradually raised to a high temperature, or, as it is technically called, 'surcharged' steam, without indicating any excess of pressure; but immediately on starting the engine, the pressure on the surface of the water being reduced, violent ebullition would take place, and the water being thrown up, being converted into ordinary steam, would be absorbed." Now, unfortunately for this nice *theory* (which is not a new one), it is NOT supported by experiment on the nature and properties of steam. "Steam," of course, may be what is termed "surcharged;" but it must, at the same time, be generated in one vessel and *surcharged* in a separate vessel; or, in other words, it cannot be "surcharged," and yet be in contact with the water. I have no need to mention any authorities upon this point, for I believe it is a recognised law, so far as our experience extends at present; but perhaps Mr. Longridge's view is the dawn of a new "era" in this respect. It appears that the explosion did not take place until the *engine* had been started two hours; but the above gentleman accounts for this in the following ingenious manner:—The violent ebullition of the water may have removed some of the scale from the flues, and allowed the water to come in contact with the hot plates to produce the above result. Now, in this case, the "scale" upon the flue must have been very thick, which would hardly appear to be possible, seeing the boiler had been cleaned (although not well) only a few *weeks* before; and I presume the ordinary *fresh* water was used, which does not produce so much sediment as "sea-water." I could pursue this subject much further, were I not apprehensive of filling up too much of your space. I will, therefore, only remark, that I consider Mr. Longridge's views in connection with this subject to be rather dangerous, and I still think the true cause of the accident, as I said before, to be in the depression of the flue, the pressure being sufficient to cause its rupture. It is of little use on occasions such as the above to conceive any nice theory, and produce it. If we use high-pressure steam, let us rather understand its true nature and properties, and use the best and strongest forms to resist it, combined with the best materials and workmanship.

I am, Sir, yours, &c.,

ENGINEER.

Manchester, May 14, 1855.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

*** The Final Specifications of Nos. 2202, 2203 have recently been filed, the Lord Chancellor having ordered an extension of the time allowed for filing them. The inventions for which these patents have been granted have already been described in our pages: No. 2202 (as No. 590), on page 357 of our last, and No. 2203 (as No. 1398), on page 43 of our present volume. The delay in the filing of these specifications arose out of the following circumstances: Mr. Monzani, the applicant in the cases of Nos. 590 and 1398, died after obtaining his Letters Patent, but before filing his Final Specifications, which the Act declares shall be under the hand of the person to whom the Letters Patent are granted. In these circumstances the applicant's widow and administratrix was advised to apply for new Letters Patent, and it was respecting the granting of these that a question arose which occasioned delay. They have, however, been granted, and the Final Specifications, as we have said, filed.

SAVOURÉ, JEAN PIERRE, of Catharine-street, Strand, Middlesex, and Rue de la Saunerie, Paris, France. *An improved gold coin detector, applicable also for weighing postal communications.* Patent dated October 28, 1854. (No. 2298.)

This invention consists in having one gauge for the weight and another for the size of gold coins, both acting simultaneously during the detecting operation.

BLAKE, CHARLES, of St. Leonard's, Sussex, painter. *A method of preventing or lessening the injurious effects arising from collisions at sea, and on other navigable waters.* Patent dated October 28, 1854. (No. 2299.)

This invention consists in fitting to the bow of a ship or other vessel a false bow, buffer, or striking-plate, attached to the end of a rod or rods working through stuffing-boxes in the bow, and connected to suitable springs.

VAUTHIER, CLAUDE FRANÇOIS, engineer, of Dijon, French Empire. *Certain improvements in blowing-machines.* Patent dated October 28, 1854. (No. 2300.)

This invention consists in constructing blowing-machines in the following manner:—The inventor takes a cylindrical metallic vessel having an aperture in the centre of both its top and bottom covers. Through the aperture in the top cover a solid piston-rod passes, while a hollow piston-rod works in the opening in the bottom cover, through which the air is ejected. In both covers, near their edges, are annular orifices provided with valves of India-rubber, gutta percha, or other suitable material, which open inwards, and are intended for the admission of air or other fluid into the machine. In the cylindrical vessel is a piston consisting of two plates, the upper of which is fixed on to the solid piston-rod which passes through the upper cover, while the lower plate is in a single piece with the hollow piston-rod which works through the bottom cover, and through which the air or other fluid is ejected. Both plates have openings through which the fluid passes into the piston from the cylinder. Inside the piston, and over these openings, are caps or valves of vulcanized India-rubber or other suitable material, so placed and adjusted as to close the openings in the top and bottom plates. These valves open inwards, and at each stroke of the piston the air or other fluid is drawn into the cylinder, and forcibly expelled through the hollow piston-rod. The machine is worked by steam or any other suitable motive agent.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent-agent. *Improvements in centrifugal machines, and in driving the same.* (A communication.) Patent dated October 28, 1854. (No. 2301.)

This invention mainly consists in the adaptation of certain rollers or cylinders to the drums of centrifugal machines.

MAGGS, OLIVER, of Bourton, Dorset, ironfounder. *Improvements in portable steam engines.* Patent dated October 30, 1854. (No. 2302.)

This invention relates, first, to boilers and furnaces, and consists—1. In a mode of forming the furnace-flues, and of arranging them within the boiler so as to strengthen it and increase the amount of heating surface. 2. In the use of and application to the fire-box of tubes or other water spaces, the upper ends of which are attached to the crown of the fire-box, and the lower ends to any other part of it. 3. In the use, and application to the boilers of portable engines of hollow trusses or arches for the purpose of strengthening the top of the fire-box, instead of solid stays. The invention relates, in the second place, to the arrangement of the remaining portions of the engine, and consists—1. In placing the cylinder and feed-pipes in the chimney. 2. In supplying a fly-wheel at each side of the boiler. 3. In the employment of a certain contrivance for adjusting the steam slide. 4. In placing the cylinder in such a position that it is made to form the upper part of the boiler.

LILIE, GUSTAVE HERMANN, of Amelia-villas, De Beauvoir-grove, Kingsland, Middlesex. *A new material for the manufacture of paper.* Patent dated October 30, 1854. (No. 2303.)

This invention consists in employing the thistle plant for the manufacture of paper.

WAINWRIGHT, JOHN, of Birkenhead, Chester, surgeon-dentist. *Improvements in fitting up shops, offices, and other like places, and shop-fronts.* Patent dated October 30, 1854. (No. 2304.)

Claims.—1. The employment of panels, pillars, and pilasters of glass in fitting up the interior of shops, offices, and other like places for the purpose of exhibiting show-cards. 2. The employment of double panels of glass in fitting up shop-fronts and doors for the above purpose. 3. The employment of double panels of glass in fitting up the interior of shops, offices, and other like places for the same purpose.

HADDAN, JOHN COOPE, of Chelsea, Middlesex, civil engineer. *Improvements in projectiles, and in machinery for manufacturing the same.* Patent dated October 30, 1854. (No. 2305.)

This invention consists—1. In making rockets and projectiles composed of shells having rockets within them, (in either case intended to be discharged from rifled cannon, and ignited or fired when in or at a distance from the cannon) with a plug or mandril which fits into the space in the powder or composition of the rocket to preserve it from being disturbed when the piece is discharged, this plug or mandril being so arranged as to leave the projectile at the moment, or immediately before, the firing of the projectile. 2. In constructing hollow projectiles with internal projections which strengthen them. 3. In certain improvements in projectiles which are to be used with wads.

CHAPUIS, PIERRE BENOIT, of Place des Repentirs Guillotière, Lyons, France. *An improvement in the harness used for weaving.* (Partly a communication.) Patent dated October 30, 1854. (No. 2306.)

Claim.—So arranging the harness of looms that it may be extended and contracted to render it suitable for weaving fabrics containing different numbers of warp-threads to the inch.

NEWALL, ROBERT STIRLING, of Gateshead. *Improvements in electric telegraphs.* (A communication.) Patent dated October 30, 1854. (No. 2308.)

This invention has for its object the so constructing electric telegraphs that a single line-wire and the earth may be employed as a means of communicating simultaneously in opposite directions between the stations. "In its application to Morse's apparatus," says the patentee, "the only alteration required is in the relay, in which the helices of the electro-magnets are formed of two separate fine copper silk-covered wires of equal size and length, and coiled the same number of times round the electro-magnets, but in opposite directions."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, gentleman. *Improvements in axle-boxes.* (A communication.) Patent dated October 30, 1854. (No. 2309.)

These improvements, which relate to the axle-boxes of ordinary carriages, consist in forming an internal rim or annular projection in the axle-box near the outer end, whereby a larger bearing or frictional surface is presented to the holding or retaining nut.

TYERMAN, THOMAS FREDERICK, of Weymouth-street, Portland-place, Middlesex, architect and surveyor. *Improvements in preparing hoop-iron and such-like metal surfaces used for bondings in buildings and structures.* Patent dated October 31, 1854. (No. 2310.)

Claim.—Preparing and treating hoop-iron, &c., in such manner as to produce "notched, or jagged, or roughened, or serrated edges, and roughened, or rasp-like, or spikey, or perforated, or undulating surfaces."

REID, WILLIAM, of University-street. *Improvements in the manufacture of galvanic batteries.* Patent dated October 31, 1854. (No. 2311.)

These improvements consist in forming a trough divided into several divisions by partitions, of one piece of glass, by moulding the same by pressure in moulds; and in protecting such troughs from injury by casing them on the outside with gutta percha, wood, coir-matting, or other tough material.

PROSSER, THOMAS, of New York, United States, now of Birkenhead, Chester, merchant and civil engineer. *Improvements in condensers of steam engines and parts connected therewith.* Patent dated October 31, 1854. (No. 2314.)

"My condensing apparatus consists," says the inventor, "of a hollow slab or chamber communicating by means of annular spaces with a like chamber above it, such annular spaces being formed by means of tubes, one within the other, the inner ones passing quite through both chambers while the outer ones merely enter into both of them."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in lithographic printing-presses.* (A communication.) Patent dated October 31, 1854. (No. 2315.)

This invention relates to an improved construction and arrangement of lithographic presses, such presses being, in the present case, worked continuously and driven by power in place of manual labour.

CRAIG, ARCHIBALD, of Paisley, Renfrew, engineer. *Improvements in the manufacture of railway wheels.* Patent dated October 31, 1854. (No. 2316.)

Claims.—1. A mode of bending the spoke bars of railway wheels, by means of swivelling and sliding blocks arranged to compress the bar against a mould-piece, the compressing action being given to the swivelling blocks, either by traversing them upon a frame between fixed resisting pulleys, by causing traversing pulleys to act upon them, they being jointed upon a fixed frame, by connecting them directly or otherwise to revolving cranks, or by turning them in upon the bar by hand by means of levers. 2. A mode of welding wheel tyres by means of rollers made to roll backward and forward upon the part of the tyre to be welded, such rollers being carried in a frame to which an oscillatory motion is communicated, or being placed in a fixed frame and having a reciprocatory partial rotation given to them whilst the tyre reciprocates between them.

BLACKBURN, BEWICKE, of Clapham-common, Surrey. *Improvements in the manufacture of pipes.* Patent dated October 31, 1854. (No. 2317.)

This invention consists in manufacturing pipes by binding small pieces of wood together (overlapping and breaking joint with each other) in a cylindrical form, and cementing them with, and completely imbedding them in asphalte or other suitable cement.

OSBORNE, THOMAS, of Leicester, engineer, and WILLIAM ELDRED, of the same place, railway contractor. *Improvements in apparatus for retarding and stopping railway carriages.* Patent dated October 31, 1854. (No. 2318.)

This invention consists in fixing on the axles of the carriages sliding cones or drums to which are attached the ends of

cords to the other end of each of which is fixed another cord that passes round the breaks which are formed in two parts, each partly embracing an axle of the carriage, and these parts are suspended on hinges or joints, and kept apart by springs in such manner that they will not come into action and bind on the axle till the drum is put in motion, and one of the cords thereon wound up.

BRADSHAW, JAMES, and WILLIAM BRADSHAW, of Blackburn, Lancaster, watchmakers. *Improvements in time-pieces.* Patent dated November 1, 1854. (No. 2320.)

Instead of using the ordinary compound spring holder or detent spring with one part strong and another very weak, fixing it firmly to the stud in the potence plate, the inventors use a simple lever and cause it to vibrate upon a staff in suitable bearings.

RAE, JAMES, of Alpha-road, New-cross, Kent, civil engineer. *Improvements in machinery or apparatus for assisting in propelling vessels.* Patent dated November 1, 1854. (No. 2321.)

This invention consists in certain means of supporting the screw propeller "in such manner that it shall at all times be maintained in its proper horizontal position, and that the after end of the shaft will be entirely independent of the rudder post, so that any shock or damage sustained by the rudder or rudder post will have no effect upon the propeller shaft, screw, or bearings."

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved method of forging or swaging railroad carriage and other wheels.* (A communication.) Patent dated November 1, 1854. (No. 2323.)

"This invention consists in swaging or hammering the block of heated metal into the form required within a die-box or anvil of the reversed form of one face of the wheel, the rim or tread, and one face of the flanch, by means of a hammer of the reversed form of the opposite face, rim, and flanch of the wheel, when the said hammer or anvil is made to rotate with an intermittent motion between the blows of the hammer."

FRANCIS, JOSEPH, of New York, United States of America. *The manufacture of wagons, caissons, and other vehicles, applicable to transport military and other stores on land and water.* Patent dated November 1, 1854. (No. 2325.)

This invention consists in constructing wagon bodies, military caissons, &c., of corrugated wrought metal.

HARGROVE, CHARLES, of Birmingham, Warwick, manufacturer. *Improvements in annealing cast-iron or in rendering cast-iron malleable.* Patent dated November 2, 1854. (No. 2327.)

Claims.—1. The use of a series of ovens or chambers made of fire clay or brick for annealing articles of cast-iron as described. 2. The recovery of peroxide of iron or iron ore that has been used for annealing iron, so as to render it fit to be used again by any of several described processes.

WALMSLEY, HENRY, and JOHN DAY, both of Failsworth, near Manchester, Lancaster. *Improvements in looms.* Patent dated November 3, 1854. (No. 2329.)

The improvements relate to the picking apparatus, and instead of the usual picking spindles, springs, or picking bands, the inventors use an angular lever, which is thrown into motion by the tappet shaft, and is brought to bear directly on the horizontal or lower limb upon the picking stick socket, and is thereby moved. They also use a double-sided or jawed swivel carrying the picking stick socket, which swivel works upon a cast-iron stud bolted to the loom, and is therefore independent of the swing rail.

TOPP, NATHANIEL, of Farnworth, Lancaster, spinner, JOHN HOLT, of the same place, spinner, and JOHN PARTINGTON, of the same place, mechanic. *Improvements in hand mules for spinning.* Patent dated November 3, 1854. (No. 2332.)

This invention consists—1. In a method of applying and bringing into action a break, so as to check the motion of the machine when the carriage arrives towards the end of the stretch. 2. In a method of facilitating the backing off by the agency of a spring, compressed during the running out of the carriage by a revolving shaft.

MOINEAU, ISIDORE ALEXANDRE, clerk, and JEAN GUSTAVE LEMASSON, professor of natural history, of Paris. *Improvements in elastic mattresses and seats.* Patent dated November 3, 1854. (No. 2333.)

Claim.—The use and application of flat steel springs or spring blades in making elastic mattresses and bolsters.

ALEXANDRE, EDOUARD, organ-builder, of Paris. *Improvements in organ-pianos.* Patent dated November 3, 1854. (No. 2334.)

The inventor combines in one instrument the mechanism of an organ and a piano independently of each other, and furnishes it with a peculiar arrangement of reed-stops.

ATHERTON, JAMES, of Preston, Lancaster, machine-maker, and JOHN KINLOCK, of the same place, manager. *Improvements in machinery or apparatus for preparing and sizing or dressing yarns or threads.* Patent dated November 3, 1854. (No. 2335.)

Claims.—1. A mode of arranging and working "tape-sizing machines," wherein

the unsized warp beams, the squeezing rollers, the rotatory brushes, and the traction rollers in front of the drying cylinders are actuated by gearing or directly. 2. A mode of actuating the unsized warp beams by means of gearing or direct mechanical connections in such manner that the ends of the yarn shall all come off the entire series of beams at or about the same instant of time. 3. The use of a frictional clutch or connecting arrangement for the purpose of winding the yarn or warp from "tape-sizing machines" on to the weaver's beams. 4. A mode of winding the yarn or warp from "tape-sizing machines" on to the weaver's beam by the agency of a frictional driving roller or pulley, having the same surface velocity as the unsized warp beams, and acting upon the surface of the warp as it is wound upon the beam. 5. The use in connection with the warping mill of an indicating apparatus for the purpose of denoting the length of warp yarn delivered. 6. A mode of warping yarns, or of beaming them upon the weaver's beam, wherein an indicating apparatus for denoting the length of warp yarn is connected and driven by the measuring roller of the warping mill. 7. The use in warping or beaming machinery of a stop-finger worked from the measuring roller of the warping mill, for the purpose of actuating the stop-rod or lever of the driving action.

SCHAEFFER, WILLIAM CHARLES THEODORE, of Stanhope-terrace, Hyde-park Gardens, analytical chemist. *Improvements in treating the waste wash-waters of woollen and other mills.* Patent dated November 3, 1854. (No. 2336.)

The object of this invention is to obtain the fatty and oily matters contained in wash-waters of woollen and other mills, and it consists in treating such wash-waters with acetic acid, tartar, and urine.

BAXTER, GEORGE LEE, of Sneinton Hermitage, Sneinton, Nottingham, dyer. *Improvements in reaping machines.* Patent dated November 4, 1854. (No. 2337.)

These improvements consist principally in the employment of a circular saw (similar to those ordinarily employed for sawing timber) mounted in an horizontal position, and caused to revolve swiftly as the machine progresses by accelerating gearing connected to one of the running wheels.

ADCOCK, JOHN, of Marlborough-road, Dalston, Middlesex, cigar-manufacturer. *The novel application of the stem or stalk of the tobacco-leaf to various useful purposes.* Patent dated November 4, 1854. (No. 2338.)

Claim.—"Converting or manufacturing the stalks or stems of the tobacco-plant into a tissue or fabric, and applying the same to the purposes for which ordinary leaf-tobacco has hitherto been employed."

BETTELEY, JOSEPH, of Liverpool, anchor-manufacturer. *Improvements in the construction and manufacture of iron knees, and the application thereof for ships' fastenings.* Patent dated November 6, 1854. (No. 2343.)

This invention consists in manufacturing knees of rolled iron of peculiar sectional forms in place of forging them solid as heretofore.

ENSOR, FREDERIC RAINFORD, of the Park, Nottingham. *Improvements in bobbin net or twist lace machinery.* Patent dated November 6, 1854. (No. 2344.)

This invention is applicable when Jacquard or other pattern surfaces move the several warp bars simply to and fro and the real position of the warp threads is governed by what is called a split bar or other similar spacing instrument, and the inventor employs certain fixed and movable stops which control the warp threads at every passage or swing of the carriage to and fro.

WALLACE, JAMES, junior, of Glasgow, Lanark, North Britain, manufacturer. *Improvements in zincographic and lithographic printing.* Patent dated November 6, 1854. (No. 2345.)

Claims.—1. The general arrangement and construction of zincographic and lithographic printing apparatus as described. 2. A mode of making the printing roller of zincographic cylinder printing machines of solid metal, the centre of the roller being of cast iron or other metal whilst the outer portion is of zinc, but of such a thickness as not to be affected by the working pressure. 3. A mode of moistening the surface of zincographic printing rollers by means of a saturated roller and a pad, the former applying moisture to the roller, and the latter subsequently taking away the superfluous moisture. 4. A mode of granulating or preparing the surface of zincographic printing rollers by means of a rubbing surface supplied with emery or other powder and made to traverse from end to end of the roller whilst the latter is made to rotate, the two being connected by suitable gearing and actuated together.

CHILDS, WILLIAM, the younger, of Brighton, Sussex, manufacturer. *An improvement in the manufacture of pipes and tubes.* Patent dated November 6, 1854. (No. 2346.)

Claim.—The mode of manufacturing metal pipes and tubes by employing ribbons or strips of metal tapered or chamfered at the edges so as to make a scarf joint when brought together; and forming the pipes or tubes by winding the ribbons or strips

spirally round a cylinder or mandril, the edges being welded as quickly as they are brought together, or as fast as the pipe or tube is formed, in the manner described.

LANGLOIS, LOUIS NAPOLEON, of Paris, merchant. *Improvements in the construction of steam-boats.* Patent dated November 7, 1854. (No. 2350.)

The inventor proposes to employ a peculiar form of paddle-wheel in a space hollowed out in the stern of the vessel.

HOGG, EDWARD, of Charles-street, Gateshead, Durham, engineer. *Improvements in shot and shell.* Patent dated November 7, 1854. (No. 2352.)

This invention consists in forming spiral grooves on the head or fore part of a shot or shell so as to give it a rotary motion when fired from a gun with a cylindrical barrel, and in forming the after end of it hollow so as to gain a preponderance of weight at the fore part.

HOW, ANDREW PEDDIE, of Mark-lane, London, engineer. *An improved machine for cutting metal rods and bars.* Patent dated November 7, 1854. (No. 2353.)

Claim.—An improved machine for cutting metal rods and bars in which the cutting is effected by a cutter or die placed eccentrically in a disc or plate, and brought down and caused to act against a fixed edge or die by hand or other power.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ADCOCK, HENRY, of London, civil engineer. *Improvements in strengthening castings of iron and other metals.* Application dated October 28, 1854. (No. 2294.)

This invention consists in introducing into cast-iron and other metals, rods or strips of wrought iron arranged longitudinally and transversely across the moulds prior to pouring into them the liquid metal.

MUMBY, GEORGE, of Hunter-street, Brunswick-square, Middlesex, mechanical draughtsman. *Improvements in reservoir penholders, and other writing apparatus.* Application dated October 28, 1854. (No. 2296.)

These improvements mainly consist in the use of a tube which, by means of an elastic or other material, is made to fit accurately to the lower end of a quill, or of a metal or elastic tube, for the purpose of directing the flow of ink to the pen.

VORSTER, CHARLES, of Cologne, in Prussia, manufacturer. *Improvements in the manufacture of ribbons.* Application dated October 31, 1854. (No. 2313.)

Instead of manufacturing the textile fabrics intended for ribbons of a breadth which the ribbons are ultimately to have, the inventor uses woven fabrics or felt in the piece, or of the collective breadths of many ribbons, and prints them, afterwards cutting them into strips.

ROBB, JAMES BIRSCH, of Boston, United States of America, counsellor-at-law. *Improvements in brakes or retarding apparatus.* Application dated November 1, 1854. (No. 2322.)

The inventor employs as brakes a number of friction pulleys, of about one-third the diameter of the running wheels, mounted on transverse rods running across the underside of the carriage-framing near the surface of the rails.

BRINTON, HENRY, junior, of Kidderminster, carpet manufacturer, and RICHARD SMITH, weaver, of the same place. *Improvements in the manufacture of carpets, hearth-rugs, and other like fabrics.* Application dated November 1, 1854. (No. 2324.)

This invention consists in the use of two or more beams of warp, one of which revolves faster than the other, the object being to form a double back and bring up a top shute.

GEDGE, JOHN, of Wellington-street, Middlesex. *Improvements in machinery or apparatus for grinding.* (A communication.) Application dated Nov. 2, 1854. (No. 2326.)

The patentee proposes to drive two grindstones by means of an arrangement of fly-wheels furnished with handles, toothed-wheels, and trundles, &c.

DEWEY, LORING D., of New York, United States of America, now resident in London. *Protection against fire in vessels or buildings by putting out the fire without personal aid, or with very little, and against incendiary or fraudulent fires and ravages of vermin. He is the true inventor of it in part, and proprietor of the whole.* Application dated November 2, 1854. (No. 2328.)

This invention consists in so "applying certain materials, mineral and vegetable, combined in appropriate construction, that an anti-combustive gas will be generated in burning, or water discharged, or both, to stop and put out the fire, though no agent is present but the fire itself."

PARSONS, PERCEVAL MOSES, of Duke-street, Adelphi, Middlesex. *Certain improvements in railway-carriage axle-bearings.* Application dated November 3, 1854. (No. 2330.)

This invention consists in making axle-bearings of hard woods.

MAURICE, CLAUDE LAURENT VICTOR, civil engineer, of St. Etienne, Loire, in the French empire. *Certain improvements in carbonizing coal, and in apparatus to be employed therein.* Application dated November 3, 1854. (No. 2331.)

The inventor carbonizes the coal in a coke oven having an aperture or flue on the

top. In the brickwork of this oven he constructs a series of inclined passages, which enter the oven above the surface of the charge of coal, and are directed upwards towards the aperture in the top These passages communicate with a flue or flues, running round the oven, by which air is admitted.

WRIGHT, WILLIAM JOHN, of Redcross-street, Cripplegate, London, snuff and tobacco manufacturer. *The novel application of the stem or stalk of the tobacco leaf.* Application dated November 4, 1854. (No. 2339.)

This invention consists in manufacturing t .e stalks or stems into an imitation of ordinary smoking tobacco.

BORDIER, HYPPOLITE, banker, of Orleans, France. *Making alcohol or spirit from different plants and vegetable productions of a farinaceous nature.* Application dated November 6, 1854. (No. 2340.)

The substances on which the inventor proposes to operate are principally couch grass, potatoes, Jerusalem artichokes, &c., "and generally all kinds of vegetables containing fecula." "These substances," says he, "are reduced to the state of flour, and are mixed with water varying in quantity according to the quantity of vegetable moisture they contain, or according as it is wished to obtain a higher or lower degree of development of saccharine matter. Into the prepared liquid I pour sulphuric acid in proper proportions, and I introduce a jet of vapour to dissolve the fecula or flour, and then add a quantity of lime or chalk to absorb or neutralize the acid. I then distil in the usual manner."

COLLIS, WILLIAM, of Barnes, Surrey, brewer. *An improvement in brewing.* Application dated November 6, 1854. (No. 2341.)

The inventor "steeps or infuses the hops in the wort at a temperature of about 196° Fahr., for about three quarters of an hour, and then boils such infusion in the wort in which the hops have been so steeped or infused for about a quarter of an hour, instead of boiling the hops and wort together for two hours."

SHAW, JOHN, of Dukinfield, Chester, machine-maker. *Improvements in guns and fire-arms.* Application dated November 6, 1854. (No. 2342.)

The inventor proposes to cast two barrels together, united at the breach, the bore of the two barrels joining at the charge, so that when the gun is fired it will discharge two separate shots at the same time; and in order to make the shots more destructive, he proposes to unite them by a strong chain of any required length.

FARJON, LOUIS ALEXANDRE, mechanic, of Paris, French Empire. *An improved system of joining pipes, tubes, and conduits in general.* Application dated November 6, 1854. (No. 2347.)

This invention consists in joining the ends of pipes, etc., together by means of a clip which takes into a rim or collar on one pipe and into an inclined ring on the other, an elastic washer being interposed between the two pipes.

PACKMAN, FRANK JAMES WILSON, of Puckeridge, Herts, doctor of medicine. *A method of compressing air in air-guns, and an improved air-gun.* Application dated November 6, 1854. (No. 2348.)

This invention mainly consists in adapting a revolving breach to air-guns.

WORTS, JAMES KING, senior, JAMES WORTS, junior, both of Colchester, Essex, and ISAAC PAGE, of Langham, in the same county. *Obtaining and applying motive power.* Application dated November 7, 1854. (No. 2349.)

The inventors "propose to use a weighted lever or pendulum, which being set in motion by hand or other power, will, by its power of gravity (the movement being kept up by hand or other mechanical means), continue to swing. The upper end or part of the said lever or pendulum is attached to cranks"!

HARTOG, CARL SAMUEL HEINRICH, of Islington, Middlesex, merchant. *Improvements in fire-arms and in cartridges.* (A communication.) Application dated November 7, 1854. (No. 2351.)

The inventor constructs fire-arms with the breech fixed but with the barrels capable of sliding forward and turning on a pin, so that their open ends may be raised sufficiently above the breech to admit of the introduction of the cartridges, which are pushed up to a slight shoulder in the barrels. The barrels are moved by means of an arm carrying an eccentric pin or crank, the motion of which cocks the gun at the same time. The cartridge is fixed by means of a needle which is forced by means of a hammer, or lever and spring, through the powder, and strikes an explosive composition contained in the cartridge.

⁂ The documents of Nos. 2307 and 2374 are with the Law Officers under objection.

PROVISIONAL PROTECTIONS.

Dated April 23, 1855.

902. Alexandre Balan, of Paris, France, engineer. Improvements in transporting passengers and goods.

904. Joseph Wright, of Sussex-terrace, Islington, machinist, and Edward Brimble, of Cheapside, warehouseman. Improvements in the manufacture of stays or corsets, and in the means or method of fastening the same.

906. Alfred Jenkin, of Zell-on-the-Moselle,

Prussia, engineer. Improvements in furnaces for the reduction and calcination of lead and copper ores.

908. William Gossage, of Widnes, Lancaster, chemist. Improvements in the manufacture of certain kinds of soap.

Dated April 30, 1855.

964. Robert Burns, of Liverpool, Lancaster, engineer. Improvements in propelling vessels.

966. John Wallworth and Daniel Taylor, of Manchester, Lancaster. An improved stand pipe for hydrants.

968. Archibald Buchanan, of Catrine, Ayr, manufacturer, and James Barclay, of the same place, manager. Improvements in beetling or finishing textile fabrics.

970. Pierre Dépierre, merchant, of Rue de Seine, Paris, France. Improvements in dyeing, part of which improvements is applicable to the manufacture of ink. A communication.

Dated May 1, 1855.

971. James Torbitt, of Belfast, Antrim, Ireland, wine merchant. Improvements in the treatment and preservation of a constituent part of the potato.

972. Thomas Hunt, of the London and North Western Railway Engine Works, Crewe, Chester, civil engineer. Improvements in the permanent ways of railways.

973. William Eassie, of Gloucester, railway contractor. Improvements in machinery or apparatus for stopping or retarding railway trains.

975. William Hartley, of Bury, Lancaster, engineer. Improvements in safety-valves, and in apparatus connected therewith, applicable also to regulating the flow of steam for other purposes.

976. James Edward Boyd, of Hither-green, Lewisham, Kent, gentleman. A ship's course indicator or exhibitor, for the purpose of exhibiting to the helmsman and others, in a legible manner, the course which a ship is to steer, as well as for certain improvements in ships' compasses.

977. George Fisher, of Cardiff, Glamorgan, engineer. An improved buffer for railway carriages.

978. Lemuel Wellman Wright, of Birmingham, Warwick, engineer. Certain improvements in locks.

979. William Banks, mechanic, Henry Hampson, bleacher, and John Banks, boiler maker, of Bolton-le-Moors, Lancaster. Improvements in machinery or apparatus for bleaching yarns or thread, either in the cop or hank.

980. Robert Adcock, of Wolverhampton, Stafford, engineer. Improvements in the purifying processes of alcoholic liquids. A communication.

981. William Hemsley, of Melbourne, near Derby. Improvements in cutting warp fabrics.

Dated May 2, 1855.

983. Thomas Lambert, of Harrington-square, Middlesex, pianoforte manufacturer. Improvements in pianofortes.

984. Frederick William Harrold, of Birmingham, Warwick, merchant. An improvement or improvements in the manufacture of the frames of slates used for writing on. A communication.

985. Samuel William Campain, of Deeping Fens, Lincoln, farmer. Improved machinery for filling corn and other sacks.

986. Henry Lee, the younger, of Lambeth, Surrey, contractor, and John Gilbert, of Hackney-road, Middlesex, engineer. Certain machinery for mixing the substances used in the formation of concrete and other like substances.

987. Thomas Ridgway Bridson, of Bolton-le-Moors, Lancaster, bleacher. Improvements in preparing, beetling, or finishing textile fabrics.

988. Marie Amédié Charles Mellier, of Rue de Seine, St. Germain, Paris. An improvement in the manufacture of paper.

Dated May 3, 1855.

989. William Basford, of Penclawdd, Glamorganshire, engineer. Improvements in purifying coal gas and for obtaining a residium therefrom which may be used as a pigment or colour, or for other useful purposes.

990. John Burgess, junior, of Birmingham, Warwick, manufacturer. A new or improved comb.

991. William Rowett, of Liverpool, Lancaster, merchant. Improvements in fitting, handing, and reefing vessels' sails.

992. John Platt, of Oldham, Lancaster, mechanical engineer, and James Taylor, of Hollinwood, overlooker. Improvements in looms for weaving.

Dated May 4, 1855.

993. Thomas Horton, of Birmingham, Warwick, manufacturer. An improvement in the manufacture of charcoal and pyroligneous acid.

994. Fielding Fletcher, of Birmingham, Warwick, manufacturer of water-closets and general plumbers' work. Certain improvements in water-closets.

995. William Henry Marks, of London, gentleman. Signalling the approach of vessels at sea.

996. Rodolphe Thiers, of Lyons, France. A machine for manufacturing stretchers of umbrellas and parasols.

998. Joseph Lacassagne and Rodolphe Thiers, of Lyons, France. An electro metric regulator for electric telegraphing, lighting, and electro-motive purposes.

999. John Hamilton, junior, of James-street, Liverpool. Improvements in the construction of iron girders.

1000. Daniel Dalton, of Chester, ironmaster. Improvements in furnaces for the smelting iron ore and iron stone, and other stones and ores.

1001. John Trotman, of Cornhill. Improvements in the manufacture of screw and other submerged propellers.

Dated May 5, 1855.

1002. Robert Midgley, of Salterlee-mill, Halifax, York, and George Collier, of Halifax. Improvements in preparing yarns for weaving and other purposes.

1004. Alexander Brandon, of Paris, France, gentleman. Improvements in heating and warming apparatus.

1006. Matthew Butcher, of Birmingham, Warwick, manufacturer, and Thomas Henry Newey, of Birmingham, machinist. Improvements in forge hammers.

1008. Henri Gustave Adrien Pecoul, civil engineer, of Rue de l'Echiquier, Paris. A new mode of generating power in steam-engines.

Dated May 7, 1855.

1010. James Pearson, of Pyle-house, Totterdown, near Bristol, Somerset, civil engineer. Improvements in the method of fastening tyres on wheels.

1012. Daniel Foxwell, of Manchester, Lancaster, card manufacturer. Improvements in machinery or apparatus for making wire cards, and in the manufacture thereof.

1014. Ebenezer Tyzack, of Abbey Dale Works, Sheffield. An improvement in scythes.

1016. Johnson Hands, of Epsom, Surrey. Improvements in boiler and other furnaces and flues.

1018. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of paper and cardboard. A communication from Francis Joseph Bérendorf, of Paris, France, mechanician.

1020. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the consumption or prevention of smoke. A communication from Etienne Bourgeois, of Rheims, France, card manufacturer.

1022. James Lewis, of Holborn, London, manufacturer of refined soaps. An improved soap.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1061. Nehemiah Brough, of Birmingham, Warwick, machinist. Improvements in slide buckles. May 11, 1855.

1066. David Caddick, of the Ebbw Vale Iron Works, Monmouth, mason. Improvements in puddling furnaces. May 11, 1855.

1067. Arthur Warner, of New Broad-street, London. Improvements in combining sheets of copper, or its alloys, with lead, tin, zinc, nickel, gold, silver, platinum, or alloys containing these metals, or some of them, with or without the addition of copper, antimony, bismuth, arsenic, manganese, or mercury. May 12, 1855.

1068. Adam Guild, of Manchester, Lancaster, engineer. Improvements in the process of bowking. May 12, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," May 22nd, 1855.*)

63. William Thomas Henley. Improvements in steam boilers or generators, and in apparatus in connection therewith.

68. Louis Pierre Lehugeur and Michel Uttinger. Improvements applicable to machinery for printing fabrics.

76. James Wood. An improved process for lettering and ornamenting glass, which the inventor terms "hyalotypy."

83. François Victor Guyard. Certain improvements in the electro-telegraphic communications.

94. John Graham. Improvements in fixing certain colours in or upon yarns and textile fabrics.

104. Henry Mortlock Ommaney. An improvement in the manufacture of shot, shells, hollow shot, and other projectiles.

106. George Riley. An improved false bottom for brewers', distillers', and vinegar-makers' mash-tubs.

107. Edward Haynes, jun. A smoke-consuming furnace.

109. Urbain Charles Choisnet and Charles Emile Giajola. Improvements in moderateur lamps.

115. Jonathan Saunders. An improvement in the manufacture of axles and shafting.

118. George William Garrood. An improved apparatus to be used in conjunction with windlasses on ships, cranes on land, and with other machinery for raising or lowering weights for the purpose of guiding and controlling the action thereof.

123. David Davidson. Improved apparatus for pointing ordnance and restoring the aim of the piece either by day or night when it is once obtained.

133. Evan Leigh. Certain improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.

142. Charles Frederick Stansbury. Improvements in the construction and operation of self-acting railway-breaks. A communication from James J McComb, of New Orleans, United States of America.

158. Auguste Edouard Loradoux Bellford. Improvements in paddle-wheels for propelling vessels in water. A communication from John Upham Wallis, of Dansville, United States of America.

161. John Henry Johnson. Improvements in the construction of seats and similar articles of furniture. A communication from Pierre Scholtus, of Paris, France, piano manufacturer.

164. Henry Carr. Certain improvements in railway crossings.

173. Frederic Prince. Improvements in cartridges for fire-arms.

192. John Henry Johnson. Improvements in machinery or apparatus for preparing cotton and similar fibrous materials. A communication from Charles Leyherr, of Laval, France, spinner.

217. John Doddridge Humphreys. Improvements in steam engines.

242. Auguste Edouard Loradoux Bellford. Improvements in machinery for forging nuts and washers. A communication from Charles H. Wateron, of America.

294. Alfred Vincent Newton. An improved construction of spur. A communication.

453. Thomas Sadleir. An improved apparatus and method of manufacturing charcoal, which can also be applied to cooking and other purposes.

490. Richard Van Valkenburgh de Guisen. Improvements in anchors.

494. William Hyde. Improved marine life-preserving apparatus.

539. William Smith. Safety harness. A communication.

622. Thomas Mara Fell and Francis Squire. Improvements in balance levers and apparatus for weighing and modifications thereof for the purpose of detecting base coin.

794. Charles Blunt and Joseph John William Watson. Improvements in the composition of artificial fuel, with the machinery employed in the manufacture thereof.

799. Jean Vincent Marie Dopter. Certain improvements in printing fabrics.

800. Eugène Pasquier. An improved machine to be used for drying wool and other fibrous materials.

812. William Terry. Improvements appertaining to breech-loading fire-arms.

830. Gustave Irenée Sculfort. An improvement in screw-wrenches.

831. Peter Armand Lecomte de Fontainemoreau. Improvements in the production of a felted tissue, applicable to replacing leather in the manufacture of cards. A communication.

859. Frederick Russell. Improvements in hanging window-sashes.

885. Horatio Allen. Improvements in the valves of steam and other engines.

893. Henri Schoofs. Improvements in making, fixing, or attaching artificial teeth, gums, and palates.

906. Alfred Jenkin. Improvements in furnaces for the reduction and calcination of lead and copper ores.

908. William Gossage. Improvements in the manufacture of certain kinds of soap.

911. William Westley Richards. An improvement or improvements in repeating or revolving fire-arms.

912. Josiah Horsfall. Machinery for mitreing moulded and other sashes.

945. Auguste Edouard Loradoux Bellford. A new combination of slide valves and ports for the induction and eduction of steam and other elastic fluid, in steam engines or other engines of similar character. A communication.

946. William Shears. An improvement in cases or magazines for gunpowder or other explosive preparations or compounds.

951. Thomas Page. Improvements in ordnance.

954. Morris Lyons. An improved enamel for coating metals and bricks.

968. Archibald Buchanan. Improvements in beetling or finishing textile fabrics.

971. James Torbitt. Improvements in the treatment and preservation of a constituent part of the potato.

972. Thomas Hunt. Improvements in the permanent ways of railways.

984. Frederick William Harrold. An improvement or improvements in the manufacture of the frames of slates used for writing on. A communication.

987. Thomas Ridgway Bridson. Improvements in preparing, beetling, or finishing textile fabrics.

1010 James Pearson. Improvements in the method of fastening tires on wheels.

1012. Daniel Foxwell. Improvements in machinery or apparatus for making wire cards, and in the manufacture thereof.

1067. Arthur Warner. Improvements in combining sheets of copper, or its alloys, with lead, tin, zinc, nickel, gold, silver, platinum, or alloys containing these metals, or some of them, with or without the addition of copper, antimony, bismuth, arsenic, manganese, or mercury.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed May 18, 1855.

2451. Henry Diaper.
2453. Pierre Alexandre Dulaurens and Marie Anatole Laubry.
2461. Edmund Hunt.
2463. Jean Baptiste Bagary.
2473. Charles Crickmay.
2491. Richard Roberts.
2503. Thomas Restell.
2505. Alfred Vincent Newton.
2508. Thomas Knight and Stephen Knight.
2519. John Mason and Leonard Kaberry.
2530. Thomas Restell.
2537. Longin Gantert.
2546. Robert Shaw.
2551. James Porritt.
2555. Cromwell Fleetwood Varley.
2585. John Thom.
2604. William Grindley Craig.
2605. Isaac Dodds.
2643. Luke Turner.
2665. Thomas Hart.
2668. John Henry Johnson.
2701. Louis Joseph Frédéric Marguerite.
2742. Gerd Jacob Bensen.

1855.

85. Christopher Turner.
101. John Greenwood.
213. Auguste Léopold Lenoir.
369. Charles Roper Mead.
393. Robert M'Connell.
431. Alexander Theophilus Blakely
529. James Bullough.
591. William Hill.
639. John Scott Russell.

Sealed May 22, 1855.

2464. Richard Terrett.
2472. Edmund Eaborn, Matthew Robinson, and John Kendrick.
2476. Stephen Shaw.
2483. Riley Cunliffe.
2484. Robert Willan and Daniel Mills.
2492. Thomas Greenshields.
2506. Charles Peterson.
2509. John Abraham.
2556. John Henry Johnson.
2576. Samuel Heseltine.
2598. Edward Maniere.
2615. Joseph Mayer and John David Kind.
2642. Arthur Lyon.
2649. John Sykes.
2655. Robert Lucas Chance.

1855.

35. John Henry Johnson.
327. Richard Shirley Harris.
448. Henry Penney.
617. Alexander Robert Terry.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

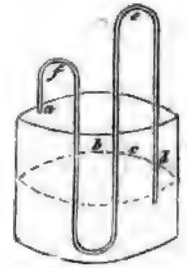
Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
April 26	3710	J. Southgate	Watling-street	Camp Bedstead.
,,	3711	G. Epitaux and L. Stead	Pall Mall	Freezing Apparatus.
May 4	3712	Alexis Soyer	Scutari	Tea Pot.
7	3713	W. S. Adams and Sons	Haymarket	Coffee Mill.
9	3714	C. Rowland	Higher Tranmere	Shirt Collar.
,,	3715	W. Langdon	Duke street	Saddle.
12	3716	G. W. Reynolds	Birmingham	Stay Fastener.
15	3717	C. Bullinger	Selsey	Self Setting Rat Trap.
21	3718	Rev. J. Burrow	Bakewell	Smoke Preventor.
,,	3719	G. Wilkins	Guildford	Sharp Key for Pianoforte.
,,	3720	H. Doulton	Lambeth	Water-closet basin.
,,	3721	W. Graham	Noble-street	Brace-ends.

PROVISIONAL REGISTRATIONS.

Apr. 26	657	W. Langdon	Duke-street	Saddle.
May 3	658	W. Kinghorne	Great Charlotte-street	Railway bottle.
5	659	S. R. English	Birmingham	Blind pulley.
,,	660	A. Lambert	Argyle-square	Whist-marker.
8	661	G. H. Indall	Bartholomew-lane	Hand signal-lump.
14	662	H. C. Tucker	Ringwood	Casement-fastener.
,,	663	H. Rodd	St. James-street	Quick filter.
15	664	H. Buck	Burnley	Stench-trap.
,,	665	J. Cuxson and C. F. Lucas.	Shiffnall	Fire-escape.
21	666	G. Forth	Chelsea	Anti-pressure hat.
22	667	J. W. C. Wren	Tottenham-court-road	Folding bedstead.

NOTICES TO CORRESPONDENTS.

A Journeyman Blacksmith writes as follows:—"Sir,—The accompanying figure represents a compound syphon placed in a cylindrical vessel partly filled with water. Now as far as my knowledge of hydraulics extends, I am led to think, when the



air is exhausted from the end, *a*, of the syphon, the water should rise in *d*, and then descend through *c*; it will then have a tendency to ascend in *b* to the height it stands in *c*; but as *b* is not as high as *c*, it must discharge itself through *a* with a force proportional to the difference of the heights of the legs, *b* and *c*, and thus we should get a continuous flow of the water through the syphon, or, in other words, 'perpetual motion.' Such I find is not the case. If some of your enlightened readers will point out the cause they will much oblige me."

If our correspondent considers the subject more carefully, he will discover that (the syphon being filled) the pressure at *e*, tending to force the water from the leg, *d*, to the leg, *c*, is equal to the atmospheric pressure, minus the weight of the column of fluid in the leg, *d*; that the downward pressure in the leg, *c*, at the level of the water in the vessel, is that pressure at *e* plus the weight of the column of water in *c*; *i.e.* (since the column in *c* is of the same weight as that in *d*), the downward pressure at *c* is equal to the atmospheric pressure: and that the upward pressure in *b*, at the level of the water, is equal to the downward pressure in *c* at the same level; *i.e.*, as we have just seen, it is equal to the atmospheric pressure. The pressure at *f*, tending to force the water out at *a*, is therefore equal to the atmospheric pressure, minus the weight of the column of fluid in *b*; and the pressure at *f* tending to force the water down the leg, *b*, is manifestly the atmospheric pressure, minus the weight of the fluid in the leg, *a*; and, this latter pressure being greater than the former, the fluid does not, of course, run out at *a*, but is forced back into the vessel.

J. Hope.—Water bearings have been frequently tried, and are found to answer for but few purposes.

John Simson.—We are not able to answer your questions.

J. H. Dickson writes: "I should feel greatly obliged if from amongst your numerous correspondents you could procure me a receipt for a non-absorbent varnish adapted for soft woods."

H. Hayes.—A succinct account of the Bude light is given in Dr. Ure's "Dictionary of Arts." We are obliged for the hint respecting the Magazine wrappers.

CONTENTS OF THIS NUMBER.

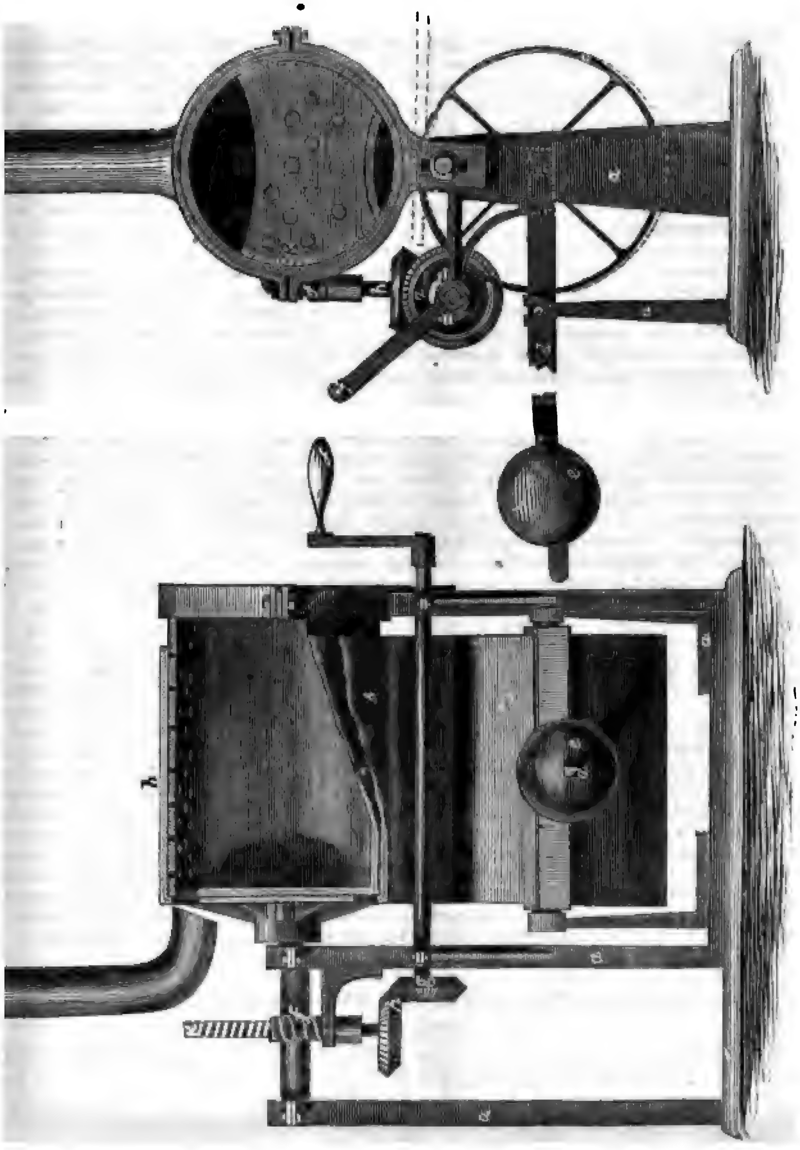
LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne Paris; Mason and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1660.] SATURDAY, JUNE 2, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

CLAYTON AND HARROP'S PATENT IMPROVEMENTS IN ORNAMENTING WOOD.



CLAYTON AND HARROP'S PATENT IMPROVEMENTS IN ORNAMENTING WOOD.

Mr. T. Clayton, of Oldham, and Mr. R. Harrop, of Lowside, near Oldham, patented, on the 26th September, 1854, an invention which applies "to the production or transferring of the various elaborate and beautiful grains or markings of the choice woods, as mahogany, rosewood, oak, &c., on to or upon the surface of commoner or cheaper wood, as deal or pine. A considerable advantage is obtained," say they, "by our process over the present method of producing figures by painting, graining, and varnishing, as the choicest grain may be multiplied on a surface or panelling of coarse or cheap wood to a great extent with extreme speed, and repainting will be rendered unnecessary, owing to the durability of the produced by this invention."

In order to produce their artificial graining, they employ heated rollers (or flat dies, if preferred), having the device or pattern of the graining engraved upon the surface, these rollers being passed over and upon the surface of the common wood on which the design is to be transferred. The deeper indentations of the roller do not necessarily press upon the wood, the more elevated projections forming the pattern first coming in contact with it, causing a slightly charred or scorched surface.

Their improvements relate also to the machinery or apparatus used in connection with flat dies (or rollers, if preferred), for the production of scroll-work, borders, and other devices and designs. The dies are placed at one end of a long bar or block of iron, with designs engraved upon the face of them. One end of this iron bar—the opposite to that which carries the dies—is placed in a furnace so that the heat may be conducted from the furnace through the bar to the die, and by means of the intervening space of the bar, the die may always be kept at a nearly uniform heat; by depressing the hot die, the design is transferred to the wood to be operated upon, which may be at once removed, and the operation continuously repeated. By this method appropriately-tinted borders are formed for the representations produced by the improved process of graining, and by the combination of the two many beautiful varieties of ornamentation upon wood, in imitation of inlaid work, &c., may be effected.

In the engraving on the preceding page is illustrated one method which the inventors prefer of heating the large engraved top cylinders of rollers; but the same end may be obtained by simply adapting a gas tubing with several jets, so that it may at will be passed in or out of the engraved revolving cylinder or roller. The heating by gas is especially preferable where small rollers are employed, whether for transferring, graining, or ornamenting borders. It will be evident that different sizes of rollers will be required, the size being regulated according to the width of the design under operation. Fig. 1 represents a front elevation of these improvements, the upper and engraved roller, as well as the furnace, being partly shown in section, to render more distinct the method by which the top roller revolves round the stationary furnace. Fig. 2 exhibits a side elevation. *a*, *a* represent the framing and standards supporting the various parts of the machinery or apparatus; *b* is the top or engraved roller, and *c* the lower or presser roller, supported by and in connection with the counterbalance lever, *d*; *e* is the counterbalance weight, which may be regulated or shifted on the lever, *d*, according to the pressure desired to be given from the lower roller or cylinder, *c*. When the operation of impressing the wood and transferring the design from the top roller is desired to be put into effect (supposing the engraved roller sufficiently heated to impress the design), the attendant passes the piece of wood under operation between the top and bottom rollers, as indicated by the dotted lines, fig. 2, the lower roller yielding in proportion to the thickness of the piece of wood. The operator then turns the handle, *f*, giving motion to the bevil gearing, *g* and *h*, whence it is transmitted through the worm, *j*, and worm-wheel, *k*, to the upper or engraved roller, and by means of the irregular surface of the upper roller, *c*, causes the piece of wood to pass between the rollers simultaneously with the impressing of the design upon it. When the rollers or cylinders are heated with gas, the furnace cylinder may be entirely dispensed with. After the design is impressed upon the wood, it is only necessary to scrape it lightly or rub it down with fine sand or glass paper, when the wood is fit for varnishing, which completes the process.

ON THE ELECTRO-CHEMICAL DEPOSITION OF METALS.

BY ALEXANDER WATT.*

Having been for many years practically engaged in the arts of electro-plating and gilding, on a very extensive scale, during which period many thousand ounces of the precious metals have been deposited by me from their various solutions, and having paid

* From the *Chemist*.

great attention to the subject of electro-deposition generally, I have, in common with others, met with many difficulties, which careful experiment and perseverance have overcome. I take the present opportunity of laying before the readers of *The Chemist* the results of my own practical experience, in the hope that they may prove useful to those who pursue the study of electro-deposition for amusement or profit.

As I have, I believe, been more successful in my operations than many of my fellow-labourers, I will carefully describe those processes which I have found to answer best, from their certainty, economy, and simplicity, and pass in review the processes usually employed by others, explaining the causes of failure and disappointment so frequently accompanying their adoption.

To render myself as intelligible to the working electro-plater as to the scientific reader, I will fully explain the meaning of any technical terms which may necessarily occur in the way, so that he may not fall into blunders, already too common among practical electro-platers, and even among those who have written on these arts—I allude to the confusion of the *positive* with the *negative* poles, the *anode* with the *cathode*, *quantity* with *intensity*, electricity, &c., &c.

In depositing metals from their solutions, many forms of the galvanic battery are employed. Among those most commonly in use are Daniell's, Smee's, Wollaston's, and Bunsen's. The first of these, Daniell's battery, has been almost abandoned, principally, I think, because it has seldom been properly applied: the second, Smee's battery, although very extravagant and uncertain in its action, is still much employed, owing to the great *intensity* of the current it produces (a quality of but little service to the electro-plater when the *quantity* is deficient); the third, Wollaston's battery, by far superior to the latter, as it yields a great *quantity* of electricity of considerable tension, is still frequently employed, or, at all events, modifications of it, which are fitted up with but little trouble and expense; whilst Bunsen's battery, in consequence of its expensiveness in use, is seldom employed by experienced electro-platers; in fact, it is in every respect inapplicable to the purposes of electro-plating and gilding, whether the art be practised for recreation or gain.

It must be borne in mind that, in order to ensure a perfectly smooth, equal, and regular deposit on a metallic surface, the battery to be employed for the purpose should yield a *considerable quantity of electricity of sufficient intensity to work with activity and advantage.* A battery constructed with a large surface of positive and negative elements will yield a current of such feeble intensity that, when employed for the purposes of electro-deposition, the deposit takes place very slowly, whilst a battery, consisting of a great number of small plates or cells, would not only deposit the metal in a granular or even pulverulent form, but would actually decompose the solution itself. Consequently, in order to obtain a good deposit of any metal, a battery should be employed whose positive and negative elements are in such relative proportion as to yield a current of quantity electricity of sufficient intensity to enable that quantity to work well.

The battery which I have found most constant and certain in its action I shall describe further on.

Faraday employs the terms *anode*, *anelectrode* or *positive electrode*, for the positive pole of the battery,—that which proceeds from the copper element in a Daniell's cell; and *cathode*, *cathelectrode*, or *negative electrode*, for the negative pole,—that which proceeds from the zinc element of a Daniell's cell. Professor Daniell, however, objecting to the terms *anode* and *cathode*, proposed the adoption of *zincode* and *platinode* to distinguish the positive and negative poles; but, as the elements of a battery are not necessarily composed of zinc or platinum, and as, independently of the great weight which must always attach to any system propounded by Mr. Faraday, it would be absurd to speak of *ironodes*, *leadodes*, *bismuthodes*, or *carbonodes*, when describing the poles of a battery with an element of iron, lead, bismuth, or carbon, I prefer adopting Faraday's nomenclature.

The *cathode*, or negative pole, is the wire which issues from the zinc plate or bar of a battery, and it is this wire or pole, or any metallic surface which may be attached to it, which receives the deposit in the bath.

The *anode*, or positive pole, is that wire which is attached to the copper cylinder or plate of a battery, and to this wire or pole is suspended, in close contact, the sheet or plate of metal which is destined to re-supply the solution with the amount of metal which it loses by the deposition which takes place on the cathode or article to be coated.

Professor Faraday denominates the solution, whether it be of silver, gold, copper, or any other metal from which a deposit is to be obtained, the *electrolyte*.

Quantity electricity, as I have already observed, is that kind of current which is produced when the battery is formed of large surfaces of the metallic element; it is this species of electricity which is most useful for the purposes of electro-deposition.

"Experience proves that, in general, the adherence of the oxides and of the metals gold, silver, copper, and lead on metals, is

greater as the intensity of the current is less, within certain well-known limits, and as the solution is less concentrated."—*Becquerel*, THE CHEMIST, 1843, vol. iv., p. 400.

Intensity may be given to the quantity already existing in a series of cells or plates, by increasing their number, thus,—by attaching the wire proceeding from the positive pole of one cell to the negative pole of another, and so on, until a compound battery is formed of alternate pairs. A battery thus constructed is well adapted to the purposes of electro-chemical decomposition, or *electrolisation*, the electric light, the giving of shocks, and other powerful effects of electricity; but, unless carefully applied, it would be highly injurious if devoted to electro-metallurgical operations.

An intensity current seldom lasts longer than a few hours, unless fresh exciting fluids be applied to the elements with which it is produced; but a quantity current may continue to be developed from a constant battery for months: I have known a constant battery continue in action for twelve months *without any addition whatever*, at the end of which period it still gave considerable evidences of electrical action.

The Battery.—The battery which I would most strongly recommend to the attention of the electro-plater and gilder, and of those who desire to deposit metals by electricity, generally, consists of a cylindrical stone jar, capable of holding about four gallons; inside this jar is fitted a cylinder of sheet copper (this may be 1-64th of an inch in thickness.) A strip of the copper cylinder about half an inch broad is cut off to within one inch, so as to form the negative electrode; my motive in doing this is to ensure a perfect connection between the negative pole and the cylinder, and to save the trouble of soldering. A circular piece of wood forms a covering to the jar; in the centre of this cover, a hole about two inches in diameter is bored, to which an ox-gullet or weazand is fastened, extending to the bottom of the jar, the lower end of which is carefully tied with a piece of thick twine. A zinc bar is cast, with a long, and tolerably thick copper wire in it, one end of which has been previously coiled into a helix, so as to form a spring, to prevent the breaking off the wire at its junction with the zinc bar. The ox-gullet is now nearly filled with a concentrated solution of common salt, to which a few drops of hydrochloric acid have been added, and the zinc bar immersed in it, but not allowed to touch the bottom of the gullet, which it may be prevented from doing by attaching a piece of wood across the zinc bar, to suspend it from the cover of the battery. The jar is nearly filled with *water acidulated* with two pounds of *sulphuric acid* and one ounce of nitric acid, *and the battery* is ready for use.

In the above form of battery several advantages present themselves; its action is constant, there is but little local action, and consequently but little waste; its current is regular, and is very economical in its construction and inexpensive in use.

A compound battery thus constructed will give most powerful effects when a number of cells is used, and it will continue to give these effects for a greater length of time than any battery with which I am acquainted.

In a single cell of this battery, a great quantity of electricity is disengaged of sufficient intensity for small operations, for gilding and so forth. When it is desired to deposit a considerable quantity of metal in a given time, several of these cells, alternated—that is, having the zinc wire of one cell united to the copper cylinder of the next, and so on, may be employed, by which arrangement a vast amount of metal may be deposited in a short time, when the solution is in good working condition.

In working with a Smee's battery in the large way, the rapid consumption of the zinc plates, the furious local action and offensive evolution of hydrogen gas, and the trouble and expense of amalgamating the plates, are among the many disadvantages which this battery exhibits to the practical electro-metallurgist; added to which, the current which proceeds from it is far too intense and fluctuating to enable us to obtain a smooth and regular deposit. But for many experimental purposes this is one of the most convenient and ingenious batteries known, and Mr. Smee deserves the highest credit for its introduction, as its great popularity will testify.

Wollaston's battery, were it not for the trouble and difficulty of replacing the zinc plates when they are consumed, and the constant application of exciting material which it requires, would be admirably suited to electro-metallurgical operations.

Some electro-platers have employed magneto-electricity for the deposition of metals, but not, I think, with much success, owing, no doubt, to the fact that a current of magneto-electricity would be liable to interruption, or a want of continuity. The action of revolving armatures must necessarily be interrupted, owing to the making and breaking of contact. I maintain that, in order to obtain a fair deposit, the current of electricity applied *must be continuous*.

My brother, Mr. Charles Watt, has patented a thermo-electrical battery which, when complete, bids fair to eclipse all other batteries for electro-metallurgical purposes, as it will possess all the advantages of constancy, uniformity, and economy, being, in fact, almost costless in its action.

(*To be continued.*)

ON INCONGRUOUS SOLUTIONS.

BY JAMES COCKLE, M.A., F.R.A.S., F.C.P.S., ETC.

I am induced by an allusion (*Mech. Mag.*, vol. lviii., p. 314,) to me, that has only lately come under my notice, to present, in what I deem a logical form, some speculations upon which I entered nearly eight years ago in this Journal. They may not enable us to dispense with trials of results, but they will not be without value if, in many cases, they inform us *which* we may try with the greatest probability of success.

In regions of knowledge that have undergone such inquiry as the theory of equations, it might, but a few years since, have appeared hopeless to find new fields of discovery. It seemed as if all that remained to be done was to follow the mighty traces left by such investigators as Bezout, Euler, Lagrange, and Vandermonde. Yet one result, the dazzling herald of others not less important that soon followed it, lay in the very pathway of research, and it is surprising that it should have escaped detection. The transformation of the general equation of the fifth degree to a trinomial form may be made to follow from the reduction of that of quadratic surfaces, and this last question was raised when Pacent, John Bernoulli, and Clairaut introduced a third coordinate into the geometry of Descartes. But, notwithstanding that Tschirnhausen had furnished materials for the application of this reduction to the general theory of equations, it was reserved for Mr. Jerrard to effect this transformation by his own peculiar analysis, and to arrive at that extension of the indeterminate principle which has given a new vitality to algebra. Although the transformation was otherwise arrived at in the first instance, a considerable improvement is imported into its processes by means of the reduction of the equation of quadratic surfaces. It is, perhaps, best deduced by means of my "Method of Vanishing Groups." *

The indifference with which, at one time, improvements in finite algebra were regarded, although it may serve to explain the oversight above adverted to, does not need such an example to indicate its existence. Bezout† notices this apathy, and attributes it to the ardour with which the infinitesimal analysis was pursued, and to the consequent diversion of the course of inquiry from the former channel. Poinsot* ascribes the neglect of algebra to the same cause. The attention which the improvements of Horner in one branch of the theory of equations, and of Mr. Jerrard in another, has lately received is, even when considered by itself, a sign that there is no further ground for the reproach.

From the doubts and errors which cloud over human conceptions, even the mathematical sciences enjoy no immunity. The quadrature and rectification of the circle, the trisection of an angle, the duplication of the cube, the sign of the product of unreal quantities, the doctrine of such quantities, of incommensurables, of zero, of infinity, of vanishing fractions, of limits and of series, the true expression for a logarithm, the theory of functional equations, the irreducible case in cubics, the possibility of solving equations of the fifth degree, the foreign factors of elimination, and the incongruous results of solution, afford so many illustrations of this fact.

In my *Notes* and *Horæ*† I have endeavoured to clear up some of the difficulties which encircle the question of incongruous results. And the Rev. Robert Harley and Mr. T. T. Wilkinson have since pursued the same path‡ of research. The principle invoked should be subjected to the test of experience; a test that cannot be always dispensed with, even in mathematical discussions. It was by a *physical* experiment (weighing) that the area of the cycloid was first, suggestively at least, ascertained. The rigorous methods of Hargreave and Tchebycheff§ for determining the number of primes within given limits were preceded by the partially empirical formula of Le-

* Some applications of the method of vanishing groups to the theory of surfaces will be found in my "Chapters on Analytical Geometry," published in vols. xlv., xlvi., xlvii , and xlviii. of the *Mechanics' Magazine.* I would direct the attention of the reader to the "Supplementary Chapter" at pp. 102-3, and to the "Errata" at p. 120 of the volume last-mentioned. See also the *Mathematician*, vol. ii., p. 178, note ‡, and p. 249.

† "Théorie Générale des Equations Algébriques." (Paris, 1779.) Preface, pp. i.-ii.

* See the commencement of his "Analyse," prefixed to (the third edition of) Lagrange's great work on Equations, (Paris, 1826).

† The tenth *Hora* (*Mech. Mag.* vol. xlix., pp. 555-9) contains a history of the subject of impossible equations. On the authority of Mr. Wilkinson, whose extensive research in periodical mathematical literature is well known. I may here add that MM. Terquem and Gilain have entered upon the discussion. Mr. Wilkinson's references are to the "Nouvelles Annales de Mathematiques" for January, 1844, and to tome iv., pp. 520-524. I have not as yet seen their investigations.

‡ My own investigations on this subject commence at p. 491 of vol. xlvi. of the *Mech. Mag.*, to which Journal I communicated various researches of Mr. Harley (see vols. l., liv., and lvi.) Mr. Harley has continued the discussion in the Manchester "Memoirs," (vol. ix., pp. 207—235), and Mr. Wilkinson in the *Mech. Mag.*, (vol. lvi., pp. 463-4.) Mr. Finlay has also followed up the subject. (See the Manchester "Memoirs," pp. 236-42 of vol. ix., Second Series.)

§ See *Phil. Mag.* for October, 1854, (ser. iv., vol. viii.), p. 114, *et seq.*; Liouville's "Journal," tome xvii., pp. 366—390.

gendre. The reverse process, an appeal to examples, will aid us in deciding whether to adopt, reject, or modify the following propositions:

1. The square root of a squared negative number is the negative number itself. The positive root is in general incongruous.

2. When from a squared negative number, we subtract a positive number less than the square, the square root of the difference is negative, and its positive value, in* general, incongruous.†

3. In adding or subtracting quantities of the form‡

$$r(+1)^2+s(-1)^2,\ t(+1)^2+u(-1)^2,$$

the result must be represented by

$$(r\pm t)(+1)^2+(s\pm u)(-1)^2,$$

and the preceding propositions, if possible, applied to it. The same remark, *mutatis mutandis*, applies whatever operations be performed on expressions of the above form.

Let there be given

$$x^2-2ax+b^2=0,$$

or $$x^2+2(-a)x=-b^2;$$

then, $$x^2+2(-a)x+(-a)^2=$$

$$(-a)^2-b^2=a^2(-1)^2-b^2,$$

or $$x-a=\sqrt{a^2(-1)^2-b^2}.$$

Now, in virtue of prop. 2, we affirm that, if a be greater than b,

$$x=a-\sqrt{a^2(-1)^2-b^2},$$

and that the other value (obtainable by prefixing the positive sign to the radical) is incongruous to the problem which gives rise to the given quadratic, although valid as an analytical solution of that equation.

Let us now consider the following propositions, which are the complements of 1. and 2. respectively.

4. The square root of a squared positive number is the positive number itself. The negative root is, in general, incongruous.

5. When from a squared positive number we subtract a positive number less than the square, the square root of the difference is positive, and its negative value, in general, incongruous.§

Thus, if we put the given quadratic under the form

$$(-x)^2+2a(-x)=-b^2,$$

we find

$$(-x+a)^2=a^2(+1)^2-b^2,$$

or $$-x+a=\sqrt{a^2(+1)^2-b^2}.$$

Now, in virtue of prop. 5, we affirm that, if a be greater than b, the *positive* value of the radical is to be taken. We are thus conducted to the same "congruous" solution as that at which we have already arrived.

I shall apply these principles to a problem in mensuration proposed at p. 326 and solved at p. 417 of vol. xliv. of the *Mechanics' Magazine*. The two solutions (of Mr. A. Colvin, and "Centurion") agree.

Adopting the notation of the gifted "Centurion," who points out an error in Dalby's result, we have

$$1300+(50-x)^2=78x-234,$$

or $$(-x)^2+178(-x)=-4304,$$

whence,

$$-x+89=\sqrt{7921(+1)^2-4304},$$

and $$x=89-62\cdot3458098=26\cdot654$$

nearly. The other value of x (161·36 nearly) though real and positive, is incongruous to the problem, and rejected *à priori* by observing the affections of the symbols employed.

4, Pump-court, Temple, May 12, 1855.

* Not universally. See *Mech. Mag.*, vol. xlvi., p. 517.

† For examples, see *Mech. Mag.*, vol. xlvi., pp. 491-2, 516; vol. xlvii., pp. 13, 14, &c.

‡ See *Mech. Mag.*, vol. xlvi., p. 491; vol. xlix., p. 519; *Phil. Mag.* for June, 1852, (ser. iv., vol. iii., p. 439.)

§ See *Mech. Mag.*, vol. xlvii., pp. 13, 14, where, by observing the method of the present paper, we *may exhibit* the congruity and incongruity of the *results with* somewhat greater clearness.

SCIENCE AMONG THE ENGINEERS.

THE BOILER EXPLOSION AT CRAWSHAW BOOTH.

The recent explosion of a boiler at Crawshaw Booth has given rise to much discussion, the reports of the engineers appointed to examine the circumstances connected with it differing widely on several important points. Our correspondent, "Engineer," drew attention to the subject in our last Number, and as the questions under discussion are of considerable interest to a great portion of our readers, we now lay before them the following additional facts derived from the *Manchester Weekly Advertiser*, in which the reports of Mr. Roberts and Mr. Longridge have appeared.

On the report of Mr. Longridge, Messrs. Holcroft and Hoyle, of Cross-street, in this city, engineers, say:

"Mr. Longridge finds sufficient cause for the explosion, without supposing any deficiency of water in the boiler, 'in the height of the external flues, and the incrustation on the plates. For it is evident,' he says, 'that the heat in the upper part of the flues, which are so much above the centre of the boiler, would be conducted by the plates to the upper part of the boiler, and thus be trans-

mitted to the steam instead of to the water.' The effect of such an action Mr. Longridge conceives would be to 'surcharge' the steam, or, as he himself explains it, to 'increase the temperature, without increasing its pressure.' Now, in this point we join issue with Mr. Longridge, denying the possibility of such an action taking place. For admitting, merely for the sake of argument, that the heat were thus transmitted to the steam, while it still remains in contact with the water, by the natural tendency of all bodies to an equilibrium of temperature, a balance of temperature would be speedily restored and maintained; for if the steam were of a temperature higher than that of the water, with which it was held in contact, this heat would be imparted to the water, causing an increased generation of steam, and consequently an increase of pressure. In fine, as long as steam remains in contact with the water from which it is, or has been generated, no increase of temperature can be imparted, either in the water or the steam, without producing increased generation of the steam and increased pressure. It is true, there is such a thing as 'surcharging' steam, but it can only be done in a separate vessel, where the steam is no longer in contact with water; and there every additional degree of heat imparted to the steam causes an equivalent expansion of the bulk of the whole, and consequently an increase of pressure; so that to saturate steam with heat is impossible, while it is in contact with water; or, under any circumstances, to add heat to steam, without increasing its pressure, is likewise impossible.

"We could quote numerous scientific authorities in support of the theory we have adduced, as Dalton, Gay Lussac, Browne, and others; but we content ourselves with the following extracts from Turner's 'Elements of Chemistry,' edited by Liebig. Speaking of the expansion of vapours by the absorption of heat, he says:—'This law only holds of vapours when separated from the liquids that yield them. If liquid be present, heat not only expands the vapour, but increases its volume by the addition of a new quantity of vapour.' Again; Mr. Longridge, in support of his hypothesis, imagines such a quantity of water to be thrown into the boiler as to reduce the temperature of the whole volume, thus causing the scale to contract, and separating from the sides of the boiler, to admit the water to the superheated plates. Now, the feed can only lower the temperature of the water with which it is immediately in contact; and we think that if Mr. Longridge will calculate, as we have done, the quantity of water that would be required to cool down the whole volume of water, only one or two degrees—ignoring altogether the fact, that while the water is being pumped in, heat is still being imparted to the whole mass—he will agree with us, that such a supposition is scarcely tenable. Once more; Mr. Longridge finds evidence, in the streaks and splashes of mud on the sides and ends of the boiler, of the severe strains to which the boiler had been subjected, from such causes as he adduces. Now, having examined some hundreds of steam boilers of all kinds, we can bear witness to the fact, that when a boiler is or has been at work, the whole of the inner surface above the water line is perfectly free from either scale or mud; but that when, as in the present instance, by the breaking of the steam pipe any outlet is suddenly presented to the imprisoned vapour, both steam and water rush out by the opening, carrying with them whatever dirt or mud there may be in the boiler. This, we think, would satisfactorily account for the streaks and splashes mentioned by Mr. Longridge."

Upon the same report Mr. Roberts, C.E., says:—

"The first point on which Mr. Longridge treats is the increased strength that might have been given to the boiler had attention been paid to crossing the joints of the plates; to which I would remark, that however advantageous it may be in other cases to cross the joints, it would not in the present instance have prevented the explosion, but would, in all probability, as Mr. Longridge subsequently observes, have limited the extent of the fracture. I have noticed the fact of the flue having passed over the boiler, not under, as stated by Mr. Longridge, merely for the information of those persons who take an interest in such matters; the circumstance, if it have any bearing on the matter, is in favour of Mr. Longridge's theory of surcharged steam. A little reflection will, I have no doubt, convince Mr. Longridge that he is mistaken in supposing that 'had the fraction taken place on the upper instead of the lower side, it is evident the boiler would have been thrown upwards,' &c., as its tendency would be precisely the reverse. I had no idea of steam being 'surcharged' whilst resting on a large sheet of water in a state of ebullition, as no doubt that in the boiler was at the time of the accident, the engine it supplied with steam being in full operation; nor, as he supposes, that that surcharge could have been produced by the residue of heat contained in the products of combustion in their passage from the furnaces immediately under and in contact with the water on which the surcharged steam that had been 'raised to a high temperature without indicating any excess of pressure' rested."

Mr. Roberts then says he considers the

latter part of Mr. Longridge's report to contain the following fallacies:

"First,—In supposing that the heated gases after passing through six or seven yards of iron flue surrounded by water should retain heat enough to produce any material effect on the steam in the boiler in which the water was two or three inches above the top of the flue; secondly, that steam may be 'surcharged' whilst in free communication with water; thirdly, that the temperature of confined steam can be increased without increasing its pressure. Nor can I understand how, if there was 'no deficiency of water in the boiler' (and it is in evidence that there were 18 or 19 inches above the internal flues, and Mr. L. says 'the top of this external flue appears to have been about 16 inches above the top of the internal flues'), any amount of heat likely to be passing through the external flue, after having travelled six or seven yards in contact with iron flues (surrounded by water), could communicate heat enough through the water to raise the temperature of the plates forming the top of the boiler sufficiently to produce the 'spheroidal' state in the water which requires a temperature equal to that of red-hot iron to produce it; in short, it requires a higher temperature to produce that state in water than to throw off the scale from the boiler; consequently, so long as steam remained in the boiler it would keep down the temperature of the plates below that necessary to produce the 'spheroidal' effect."

In reply to Messrs. Holcroft and Hoyle and to Mr. Roberts, Mr. Longridge says:

"Messrs. Holcroft and Hoyle assert that 'if heat be transmitted to the steam, while it remains in contact with water, a balance of temperature would be speedily restored and maintained.' And further, that, 'as long as steam remains in contact with the water from which it is, or has been, generated, no increase of temperature can be imparted either to the water or the steam without producing increased generation of steam and increased pressure.'

"Now, it is a fact well known to most enginemen, that in first getting up the steam in a boiler with internal flues, the water in the lower part is often quite cool, while in the upper part there is steam of considerable pressure. This arises from want of circulation in the lower part of the boiler, water being a bad conductor of heat downwards. For the same reason, *i. e.* the slow conducting power of water, steam in the upper part of a boiler may be rapidly raised to a higher temperature, by heat transmitted through the plates, without materially increasing the temperature of the water below the surface. There undoubtedly will be evaporation from the water, owing to the higher temperature of the superincumbent steam, but this evaporation will be slow and small in amount, so that a 'balance of temperature will' not 'be speedily restored.'

"It appears to me quite evident that the temperature of the steam in contact with water may be increased much more rapidly than the vapour required for its saturation or maximum density can be supplied to it. If then this steam have not its equivalent of watery vapour, its density or pressure cannot be such as the temperature would indicate for ordinary steam. For each degree of temperature there must be a certain quantity of vapour required to produce maximum density or pressure, but if this be supplied in excess, partial condensation must ensue and the pressure be reduced. This seems to me to account for explosions not being more frequent in boilers, which, from the great height of the external flues, must often contain 'surcharged or superheated' steam, the increase of pressure being dependent on the proportion in which the vapour is supplied.

"It may, perhaps be necessary to observe, that all I have said refers to a boiler previous to the engine being started; but to a certain extent the same process of 'surcharging' the steam will continue while the engine is at work, more especially when, as in the present instance, the plates are covered in the inside with a thick incrustation of scale, a bad conductor of heat. In such cases the temperature of the plates is increased (sometimes even to redness), and a considerable portion of the heat must be conducted by the adjoining plates to the upper part of the boiler, and, therefore, to the steam.

"With regard to water in the 'spheroidal' state, Mr. Roberts is entirely in error, imagining that this can only occur when the plates are at a red heat; for it has been proved by experiment that a spheroid of water may be produced on metal at a temperature of 350° or about 600° below that usually assigned to red heat."

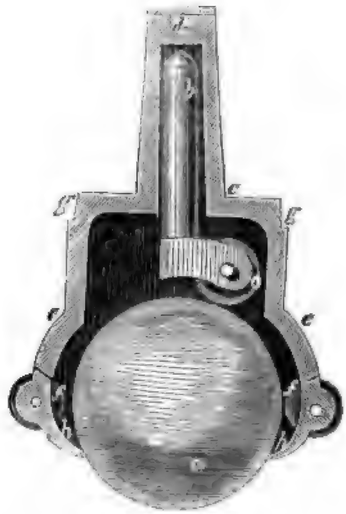
HYDE'S PATENT FURNITURE CASTORS.

Mr. Hyde, of Sheffield, patented on the 5th November, 1853, an improvement in furniture castors, which applies solely to that class of castors ordinarily termed "ball castors," and consists in a certain novel method of mounting the ball in the frame of the castor, in order to reduce the friction upon it, "by placing rollers, or friction wheels, or castors of the ordinary kind in or on any part of the frame directed to the centre of the ball, and thus to enable the ball to move or roll with

perfect freedom and ease in every direction." The globe or ball may be formed either of metal, glass, earthenware, hard wood, ivory, leather, gutta percha, or of any other suitable material; and above it, either immediately over its centre or a little from it, the inventor places an ordinary castor, furnished with one, two, or more pullies, bearing upon the ball or globe, and supporting the frame or socket of the castor that is attached to the leg or foot of the article of furniture to which the castor is to be applied. The frame may either be constructed in the form of a socket, or in any other form, or with claws or arms entirely disconnected from each other, or connected to each other by means of a ring or belt. "In the socket of the castor, or upon the claws or arms, or upon springs connected thereto," says Mr. Hyde, "are mounted small friction rollers or pullies placed in contact with and immediately or not immediately opposite to the horizontal diameter of the ball or globe, but may be a little above or a little below, or so fixed as to run or meet in contact upon any part of the ball or globe." The ends of the arms or claws are furnished with points slightly inclining towards the centre of the ball or globe, and extending just sufficiently below its horizontal diameter to prevent it from falling out of its place upon the castor being raised. Or the same end may be attained by attaching to the arms or claws a ring of metal or other suitable material of rather smaller dimensions than the diameter of the ball or globe. The particular form of the frame may be varied to almost any extent so long as the peculiar feature or principle of the invention is retained, viz., "the method above described of mounting the ball or globe, by so placing friction rollers or wheels or castors in any place, in arms, cups, or else so as to strike immediately, or not exactly immediately, as the case may be, toward the centre of the ball, so as to allow perfect freedom of action in all directions."

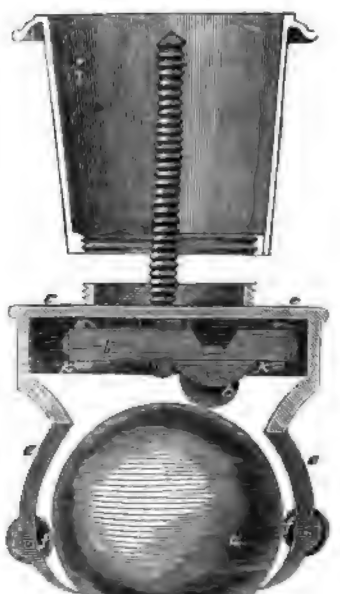
Fig. 1 represents one method of applying the invention. *a* is the ball or globe, which may be of glass, earthenware, metal, or any other suitable material. *b* is an ordinary castor bearing upon the same, and supporting the frame, *c*. *d* is a helical spring applied between the pin of the castor, *b*, and the frame, *c* (this spring may be placed in the rim or belt of frame *c*), in order to give additional freedom and elasticity. *e e* are arms, which may be of any number, in which the friction pullies, *ff*, are mounted. These pullies bear against the sides of the ball or globe, *a*, and may either be mounted directly in the arms, *e e*, as shown in the figure, or in springs connected thereto. *h h* are clips which are attached to the ends of the brackets or arms, *e e*, by means of the pins which form the axes of the friction pullies or rollers, *ff*. These clips extend

Fig. 1.



below the largest diameter of the ball, *a*, and prevent it from falling out when the castor is raised. The castor is screwed, by means

Fig. 2.



of the thread, $g\,g$, into a socket, and is attached by it to the article of furniture.

Fig. 2 represents another form of construction, in which the small castor, b, above the ball, is furnished with friction pullies, $k\,k$, running upon the outer side of the frame, c, which may be flat, round, or bevilled on their edges.

SPECIAL MUSEUMS FOR THE WORKING CLASSES.

In the month of July, 1852, a preliminary memorandum was read before the Council of the Society of Arts, in which the author, Mr. T. Twining, Jun., set forth the advantages which the working classes might derive from a collection of specimens, models, diagrams, &c., illustrative of the successful applications of modern science and ingenuity to the improvement of their condition in their dwellings, furniture, and household utensils, their food and clothing, their industrial pursuits, and their intellectual development; in short, of everything which might enable them to promote the health and comfort of themselves and their families.

Since that period Mr. Twining has pursued the project then announced, and has received great encouragement, not only from the Society of Arts and other influential bodies in this country, but also from the Emperor of the French, who sought to engraft the plan upon the *Exposition Universelle* now open in Paris, by favouring a proposition of Mr. Twining's for holding an exhibition of articles for popular use as a department of the *Exposition*. Owing to official delays, and to the peculiar difficulties which attach to any attempt to improve the condition of the working classes in France, so much time has been lost that it is now quite impossible fully to cary out the original intentions of the French Government; but the discussions which have taken place have been very favourable to the development of the plan in all its bearings, and the marks of approbation with which it has been honoured in high quarters, have induced the author to bring the subject again before the Council of the Society of Arts in a more elaborate memorandum.

It is contemplated that in every country where an earnest desire exists for the improvement of the domestic and sanitary condition of the industrial population, steps be taken by Committees already existing for benevolent purposes, or to be specially constituted, for gradually forming, with reciprocal assistance, collections of the nature above referred to, and that the international agreement required for the purpose be concerted by practical economists from the several countries assembled for the purpose at Paris.

The month of July having been fixed upon for conferences of a kindred nature, convened by the Paris Society of Philanthropic Economy,* which has obtained from the Government the most satisfactory assurances of support, that month will naturally be the time of meeting for the purpose above mentioned; and, considering the shortness of the remaining interval as regards the more distant countries, and seeing how desirable it is that all of them be fully represented, it is hoped the announcement made in the memorandum will, in the absence of a more direct invitation, be sufficient to induce the presence of practical friends of the working classes, and delegates of benevolent societies from all parts of the world.

On arriving at Paris, further information may be applied for at the *Secrétariat-Général de la Commission Impériale*.

We sincerely trust that this movement which, in our judgment, promises greater and more valuable practical results than any other project of a similar character which has recently been brought forward, will be taken up with promptness and vigour by all who are in a position to further it.

Offers of co-operation, and all other communications relative to the proposed Economic Museum, as also demands of copies of the last memorandum for distribution, and addresses of societies and individuals in this country or abroad to whom it might be desirable that it should be sent, should be directed to P. Le Neve Foster, Esq., Secretary, Society of Arts, Adelphi, London.

ATLANTIC SUB-MARINE TELEGRAPH.

The last news from Europe brought the intelligence that an electric telegraph line had been completed from Balaklava to London, and that Lord Raglan sent to and received messages daily from England. This is an important triumph of modern engineering enterprise and skill which deserves our admiration. English telegraph engineers deserve great credit for the boldness and enterprise they have exhibited in laying down so many ocean lines. In a few years more, unless our telegraph engineers move a little faster than they have done, we are afraid that John Bull will take some of the starch out of their collars, by building an ocean telegraph which will unite our country

* Société d'Économie Charitable. President, M. le Vicomte de Melun; Secretary, M. Alexis Chevalier. Office, Rue de Grenelle-Saint-Germain, No. 42, where further information on these matters can be had.

with Europe. Mr. Shaffner, when he was in Europe, it was reported, obtained grants from the Emperor of Russia and the Kings of Denmark and Sweden, to run telegraph lines through their dominions, as part of an ocean line between Europe and our continent, all of which grants, we apprehend, will be of no use whatever, unless something be done quickly to make use of them; for assuredly Uncle John has the advantage of route from Ireland to Newfoundland, and we rather think he will not neglect it. We are a people famous for acting while others are talking. Look out, American telegraph engineers, that John Bull does not steal away our good name by the construction of the first Atlantic ocean telegraph line.—*Scientific American.*

[With reference to the foregoing paragraph we may remark that the surmises of our contemporary are not without foundation, for at the Conversazione of the President of the Institution of Civil Engineers, held on Tuesday last, we saw exhibited a submarine electrical conductor, proposed as peculiarly suitable to the project of the Atlantic Telegraph Company, which we find has recently been provisionally registered in this country. This conductor differs entirely from all other submarine ropes with which we are acquainted, combining considerably increased conductibility with such a diminution in weight that the entire line from England to America may be conveniently carried in one vessel, while its strength bears a very much greater proportion to its weight than is the case with ropes of the common construction. As the cost of constructing and laying down such a line of telegraph communication would be but small when compared with the expense necessary for so gigantic an undertaking as the laying down of one of the ordinary systems, we hope and expect to hear that the above company is making progress in the carrying out of its plans.]

TEMPERING OF STEEL.

In the discussion on Mr. Sanderson's paper, "On the Manufacture of Steel," an inquiry was made as to the kind of steel suitable for particular articles, and how its quality might be tested. This gave rise to the remark that the tempering of steel depended on the skill and experience of the workman. Mr. Harry Scrivenor, of Liverpool, has, however, obtained from a clever workman the following memoranda on the subject:—

"I received your letter inquiring what steel was best for different kinds of manufactures. I should say cast-steel, if it can be applied; double shear for hatchets, or any kind of edge tool that cannot be well made of cast-steel. The temper to be as follows:—

"1st. For boring cylinders, turning rolls, or any large cast iron, let it be as hard as water will make it, minding not to heat it more than a cherry red.

	Degrees. Fahr.
2nd. Tools for turning wrought iron, pale straw colour	430
3rd. Small tools for ditto, shade of darker yellow	450
4th. Tools for wood, a shade darker	470
5th. Tools for screw taps, &c., still darker straw colour	490
6th. For hatchets, chipping chisels, brown yellow	500
7th. For small rimers, &c., yellow, slightly tinged with purple	520
8th. For shears, light purple	530
9th. For springs, swords, &c., dark purple	550
10th. For fine saws, daggers, &c., dark blue	570
11th. For hand and pit saws, &c., pale blue	590

"The temper greatly depends on the quantity of carbon that is in the steel—this the practical man soon finds out, and he tempers or draws down his tool accordingly."—*Journal of the Society of Arts.*

ON THE PROTECTION OF THE COPPER SHEATHING OF SHIPS.

To the Editor of the Mechanics' Magazine.

Sir,—I beg to submit a few remarks on the protection of copper sheathing, consisting chiefly of extracts from the "Philosophical Transactions" of 1823—24, preliminary to a proposed method, given below, of applying the protectors which were suggested by Sir H. Davy, in consequence of the experiments made by him.

I am, Sir, yours, &c.,

N. B.

The attention of the Royal Society having been directed to the rapid decay of copper sheathing, and the uncertainty of the time of its duration, by the Commissioners of the Navy Board, a committee was appointed in the year 1823 to consider the question, when Sir Humphrey Davy instituted a great number of experiments, and published a report, from which the following results are extracted:—

"It has been generally supposed that sea-water has little or no action upon pure copper; and that the rapid decay of the copper on certain ships was owing to its impurity."

A number of experiments on pure and alloyed copper, and on specimens supplied

by the Navy Board, which had been remarkable for their durability or rapid decay, made him come to the conclusion that pure copper was acted upon even more rapidly than impure, and "that the changes undergone must have depended upon other causes than the absolute quality of the metal."

The next conclusion was, that the cause of decay was the absorption of the oxygen contained in the atmospheric particles mechanically mixed with the water.

To prevent this, Sir Humphrey availed himself of a principle laid down by him some years before, and by which he discovered the base of several of the alkalies, viz., that "substances will only combine chemically when they are in different electrical states, and that by bringing a body naturally positive artificially into a negative state, its usual powers of combination are altogether destroyed."

"Copper is a metal only weakly positive in the electro-chemical scale, and, according to my ideas, it could only act upon sea-water when in a positive state, and consequently, if it could be rendered slightly negative, the corroding action of sea-water upon it would be null; and whatever might be the differences of the kind of copper sheathing, and their electrical action upon *each other*, still every effect of chemical action must be prevented if the whole surface were rendered negative. This could be done by the contact in sea-water of any metal higher in the electro-chemical scale."

Tin, zinc, and iron were accordingly tried, and "on trying $\frac{1}{200}$th part of tin, I found," says Sir Humphrey, "the effect of its preventing the corrosion of the copper perfectly decisive." "When iron was used, a deep orange precipitate was formed; but after many weeks, not the smallest portion of copper was found in the water." "A piece of zinc as large as a pea, or the point of a small iron nail, were found fully adequate to preserve forty or fifty square inches of copper; and this wherever it was placed, whether at the top, middle, or bottom of the sheet, and whether the copper was straight or bent or made into coils; and where the connection between different pieces of copper was completed by wires, or thin filaments of the fortieth or fiftieth of an inch in diameter, the effect was the same; every side, every surface, every particle of the copper remained bright whilst the iron or the zinc was slowly corroded."

A piece of copper and a piece of zinc soldered together at one of their extremities, were made to form an arc in two different vessels of sea water; and the two portions of water were connected together by a small mass of tow moistened in the *same water*; the effect of the preservation of the copper took place in the same manner as if they had been in the same vessel.

Notwithstanding the seeming conclusiveness of these experiments, the protectors were found to be ineffectual in preserving the bottom of the ship, and have therefore been discontinued.

The causes of failure seem to have been, from all I can gather, first, that the protectors were soon completely oxidized, and their influence destroyed; and before the vessel could be docked to have them replaced, the corrosion of the copper had taken place to a considerable extent.

Secondly. The corroded surfaces of the protectors became nuclei for the deposition of earthy particles, and the formation of a bed for sea-weed and shell-fish.

If this explanation be the correct one, success might be ensured, if the protectors were placed inside the vessel, and a communication made between them and the sheathing. Let the inside of the ship be coppered for a few feet at the height of the load-water line, so that a copper tube, five or six inches in diameter, may be put through the bottom, just below the water line, and have flanges to turn over on the copper surfaces within and without, to connect them. If we then place the protector on the inside surface, so as always to be below the water level in the water-tight casing round the mouth of the tube, the zinc will be as really in connection with the outside surface as if it were placed on one of the outside sheets, the water in the tube completing the circuit in the same way as the tow did in Sir Humphrey's last experiment.

There is, of course, no necessity for the copper sheeting inside if the communication between the zinc within and the copper without is made by one of the bolts through the bottom: it is only made in this form to make the principle more apparent.

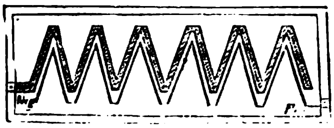
N. B.

ALLAN'S SINGLE-CELL BATTERY.

To the Editor of the Mechanics' Magazine.

SIR,—I have observed a good deal lately in your columns upon the interesting subject of the construction and combinations of galvanic batteries, and great stress seems to be laid on the advantages of single over double-fluid batteries, for many obvious reasons. Following up the subject, I beg to bring under the observation of your readers a plan of construction which may be termed the single-cell battery, which, I think, may be found very useful for many varying purposes. The positive and negative plates are bent (or cast for the purpose) in a zig-zag form, as shown in the accom-

panying diagram, which is a plan of a single-cell battery thus constructed.



In this manner a battery may be constructed to produce, along with quantity, a sufficient amount of intensity for many electro-magnetic and other effects, not otherwise attainable in a single cell.

This arrangement, when applied to a constant battery formed on the principles of my patent of October, 1852, will give, where quantity with intensity is required, great constancy and steadiness of action in a single fluid, and with but one cell.

I am, Sir, yours, &c.,
THOMAS ALLAN.

May 30, 1855.

P.S. As an experiment as to constancy, I have had a battery in action working a small electro-magnetic engine, without stopping, for ten days and nights consecutively before the force began sensibly to diminish.

FENTON'S PATENT SAFETY-VALVES.

To the Editor of the Mechanics' Magazine.

SIR,—I have but just received your monthly part for April, wherein I observe your report of the proceedings of a meeting of "mechanical engineers" at their Institution in this town. So far as relates to the safety-valves, recently patented by Mr. Fenton, of Low-moor, Yorkshire, a very high opinion was expressed by Mr. W. Fairbairn, and other eminent engineers present, as to their merits; "*the double valve, in fact, being particularly simple and complete; both the valves being locked, in effect, but still free to move and blow off.*"

You also, in your description of this invention (December 2, 1854), say it "*is calculated to put an end to boiler explosions for the future, so far at least as a safety-valve, perfect in its action, can conduce to such a result.*" And again: "*It cannot possibly be obstructed in its action, either accidentally or designedly.*"

You will, I trust, pardon me if I endeavour to point out what I conceive to be an error into which you, Mr. Fairbairn, and others have fallen in this respect. It is true, that should the spring-balance be screwed down, or the lever at that end be weighted, to resist a greater pressure than the volute-spring, the volute would then become compressed in consequence of the valve nearer to the spring-balance acting as a fulcrum, and steam would blow off at the other valve; similarly, should the volute-spring be screwed down, or weighted to excess, then steam would immediately blow off at the spring-balance valve. This, I think, is clear to all; but if the spring-balance and the volute-spring both be screwed down, it would require a greater pressure to lift the valves; or should either valve be screwed down, and the lever weighted at the other end, or should the lever be weighted at a point midway between the two valves, a similar result would be attained Indeed, by passing a cord, chain, or other flexible material round the lever at this point, and firmly attaching the ends to any part of the boiler below it, keeping the cord or chain strained tightly, it would be impossible for the steam to blow off at all.

About two years since a patent was obtained by a Mr. Humphries, of Brighton, for a single valve, acting similarly to the double valve of Mr. Fenton's, and having precisely the same defects.

I am, Sir, yours, &c., B. HUNT.

Birmingham, May 25th, 1855.

[It is only necessary for us to state, in reference to the above letter of our correspondent: 1. That the volute-spring employed in Mr. Fenton's valves is locked up by means of a padlock, and until this is removed the spring cannot be screwed down or weighted. 2. That a brass or copper dome cover is placed over the valve as usual; and unless this is removed, no cord or chain can be passed over the lever at the point suggested; at any other point it would be useless.

Of course, if arrangements are to be made on the boiler for the purpose of fastening down the valve, it is obvious that either this or any other *conceivable* valve may be rendered inoperative. The single valve referred to is not spherical, and consequently is liable to stick or lock itself.]

ON TUBULAR BOILERS.

To the Editor of the Mechanics' Magazine.

SIR,—Mr. Mushet having in your last Number again referred to the statement in my treatise on combustion, and the supposed advocacy by Mr. Craddock of the ordinary tubular boilers, I have examined the published "Description of Craddock's patent universal condensing steam engine," for the purpose of ascertaining how far I had mistaken his views, for intentional misrepresentation I utterly disclaim. The facts are as follows:

In the second of Mr. Craddock's published lectures I found the following passage. "The objections brought against

tubular boilers are as follows: Liability to priming, or the steam passing off to the engine mixed with water; irregularity in the pressure of the steam for the use of the engine, from the small quantity of water such boilers generally contain; liability of the tubes to become furred up by deposit; greater complexity, with greater original cost, and greater liability of derangement, together with their becoming short of water from the small quantity they are at any time capable of holding. I have been thus particular in *enumerating all the objections* that I have been able to collect, as being brought against tubular boilers."

These remarks manifestly appear directed to the general class of tubular boilers, rather than to that specific arrangement of tubes which forms the characteristic of Mr. Craddock's own system. Under the impression that Mr. Craddock was speaking of the ordinary tubular boilers, and to which the objections he has detailed so directly apply, I made the following observations: "Now these objections are chiefly of a mechanical nature, while those which are overlooked have reference to other, and more important influences on combustion and its processes. To Mr. Craddock's enumerations of objections may then be added the following, viz.:

1. Forcing the products of combustion (carbonic acid, nitrogen, and steam,) into the narrow orifices of the tubes, and thus producing the most unnatural mixtures with the flame, from which, in the order of nature, they had just separated themselves.

2. Dividing the flame into numerous small portions, thus lowering and attenuating its temperature before the process of combustion could have been completed.

3. Shortening the flame and diminishing its radiating power, by the conversion of the carbon of the flame into the form of soot.

4. Practically reducing the available surface, by confining it to that portion of the tubes through which the products of combustion pass.

5. Impeding the ascent of the steam not only from the surface of the tubes, but from that of the flues and furnaces under them.

6. Obstructing the circulation of the water by the narrow and intricate courses round the tubes.

7. Shortening the run or distance from the furnace to the up-table, where they become useless or dangerous.

8. Increasing the already too rapid current of those products.

9. Diminishing the available time which the processes of combustion, and the transmission of heat absolutely require.

10. Practically confining the generation of the steam to the furnaces, and the plate-surface in connection with them.

The omission of these serious objections are the more remarkable, as Mr. Craddock has himself justly observed, that "Time being one of the elements of first importance," &c.

In the beginning of the same lecture Mr. Craddock had stated that "The most obvious way to produce perfect combustion, or to prevent smoke, is to supply the air that is required to produce the combustion of the carbon, or glowing coke remaining after the gases are dissipated, at the bottom of the grate, whilst the air required for the combustion of the carburetted hydrogen should be supplied in such a manner as to come into due admixture with it before it is cooled down below the temperature of ignition."

Commenting on this passage, I added, "Here is a true summary of what is required as to air and temperature; yet the direct effect of the tubes, with their small orifices, is to cool down the gas below that temperature." Again, on the same point, I observed, "The conditions of perfect combustion are here clearly pointed out; yet so far from the tubular system, which he advocates, being in accordance with these conditions, it is in direct opposition in all that regards quantity of air, time, place, and temperature."

On the publication of my treatise Mr. Mushet observed, that in the boiler invented by Mr. Craddock the tubes were used, not for the conveyance of the flame and products of combustion, but of the water which was within the tubes, while the heat was on their outside. Having since examined Mr. Craddock's drawings, I find such is the fact. It was therefore manifestly unjust to charge his peculiar system with objections which were only applicable to the ordinary plan of tubular boilers.

Mr. Mushet is correct in saying it was an error or oversight on my part to infer that Mr. Craddock advocated the ordinary tubular boilers, while, in fact, he was but referring to his own peculiar tubular system. On looking, however, to the passages in Mr. Craddock's work, I think Mr. Mushet will admit that they were likely to lead a general reader, who was not examining the properties of the steam engine, but the chemical processes of combustion, to suppose that he was referring to the ordinary *tubular boiler*, and the more so as he had not previously made any allusion to his own peculiar application of the tubes.

In Mr. Mushet's last letter he recommends that I should "go and see what was so incorrectly described."

On Mr. Craddock's peculiar inventions I

have offered no opinion; were I indeed to do so, it would rather be in approval of his system of condensation, coupled as it is with the supplying the boilers with fresh or distilled water. On another occasion I shall have no difficulty in stating what appears to me objectionable in its application to steam navigation, whatever may be its merits on land.

I am, Sir, yours, &c.,
C. W. WILLIAMS.

Liverpool, May 26, 1855.

PALMER'S SMOKE-JACK SCREW PROPELLER.

To the Editor of the Mechanics' Magazine.

SIR,—Cannot Mr. Palmer give us more particulars of the trial of his screw than what appeared in your last number? It seems to be a rule, in publishing experiments of this nature, to give all the particulars apparently in favour of the improvement, but to withhold some particulars without which the public cannot possibly judge whether there be any improvement or not. This mode of proceeding is injurious to the parties themselves, but it is much more injurious to other really meritorious improvements. Mr. Palmer does not tell us what was the pitch of the common screw tried against his; other particulars regarding it are also wanting. Neither does he tell us the power developed by the engines; for the statement that there was the same load on the safety-valve during both trials, conveys no idea of the power exerted. It is stated that the trial was "from pier to pier;" does, then, the time mentioned include in each case the starting from a state of rest? Mr. Palmer's account of the matter is too good to be true; for the difference between 17 and 23 minutes is about 30 per cent., and it is scarcely to be expected that the common screw *can* be beaten by so much. It seems probable that the particular common screw tried against Mr. Palmer's was an inefficient one; but I think a common screw could be made to equal, or beat Mr. Palmer's. Something very similar to Mr. Palmer's has been tried before, and failed; and what trifling differences exist in Mr. Palmer's modifications, are certainly not such as to warrant our belief in its not only equalling the common screw, but beating it to the extent of 30 per cent.

These lines are prompted by my interest in screw propulsion, and will, I hope, find a place in your periodical.

I am, Sir, yours, &c.,
HELIX.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

WOODHOUSE, WILLIAM HENRY, of Parliament-street, Westminster, civil engineer. *An improved meter for water and other liquids.* Patent dated November 7, 1854. (No. 2354.)

Claim.—The construction of an improved meter for water and other liquids by combining with a cylindrical case, closed at both ends, and provided with suitable inlet and outlet passages, a measuring wheel revolving within the case and having chambers or buckets at its periphery fitted with pistons which are moved towards the centre of the wheel by the pressure of the entering water or other liquid, so as to admit of the chambers or buckets being filled in succession as the wheel revolves, and are then forced out to the periphery of the wheel as the chambers or buckets are successively discharged of their contents, by the pressure of air compressed in a reservoir communicating with or situated at the centre of the wheel;—also the use of springs for the purpose of forcing out the pistons instead of employing air pressure; and the use of flexible diaphragms fitted to the chambers or buckets instead of pistons.

SIMONS, EDWARD, of Birmingham, Warwick, manufacturer. *A new or improved candlestick.* Patent dated November 7, 1854. (No. 2356.)

The inventor describes a candlestick in which the rising of the spring on which the candle rests is made, after the lapse of any desired time, to extinguish the candle, ring a bell, or sound any other alarum.

METCALFE, THOMAS, of High-street, Camden-town, Middlesex, gentleman. *Improvements in the construction of portable carriages, chairs, and other vehicles for sitting or reclining upon.* Patent dated November 7, 1854. (No. 2357.)

This invention mainly consists in constructing vehicles with a cross framing jointed together by means of pins, studs, or pivots, such framing, when extended, being held in a given position by means of a flexible or other body, or by a band or strap extending from one rod or lever of the cross framing to the other.

BIRD, JOHN, of Chance's Firebrick-works, near Dudley. *Improvements in reverberatory furnaces.* Patent dated November 7, 1854. (No. 2358.)

This invention consists in combining the use of closed ash-pits with the use of two sets of fire-bars, one set being horizontal or only slightly inclined, and the other considerably inclined, by which means the fuel on the fire-bars is to offer a more extensive surface for the passage of air from the closed

ash-pit than if only one set of fire-bars were employed, and the air is to be as highly heated as possible before it enters the ash-pit.

BEARDMORE, WILLIAM, of the Stowage, Deptford, Kent, engineer. *An improvement in the bearings of the axles of railway carriages and locomotive engines.* Patent dated November 7, 1854. (No. 2359.)

This invention consists in constructing the bearings of the axles of railway carriages and locomotive engines of wood, and in arranging the apparatus connected therewith in such manner that a supply of water may be kept to the wood bearings.

BLAIKIE, JOHN, of Glasgow, Lanark, machinist. *Improvements in the manufacture of driving-belts, straps, and bands for machinery.* Patent dated November 7, 1854. (No. 2360.)

This invention consists in a mode of reducing a driving-belt, strap, or band to a uniform thickness by driving it between a cutting-edge and a guide-roller or gauge-piece, at a suitable distance asunder; and in a mode of tapering the end of it by passing it between a cutting-edge and a guide-roller, or guide gauge-piece, one of which is made to gradually approach the other as the belt is drawn between them.

DAVIS, GEORGE, of Southampton, Hampshire, plumber. *Improvements in taps or cocks.* Patent dated November 8, 1854. (No. 2361.)

Claim.—A combination of parts by which a valve is opened and closed by a lever resting upon a vibrating fulcrum, such valve being constructed so as to prevent the sudden closing of the tap.

GLUKMAN, LEONE, of Sackville-street, Dublin, professor of natural philosophy. *Improvements in effecting electric communications in railway trains.* Patent dated November 8, 1854. (No. 2362.)

This invention consists in the construction of certain compound hooks and eyes, or couplings, for connecting the different parts of a metallic circuit through which electricity of low tension is to pass.

STEAD, WILLIAM, WILLIAM SPENCE, and SAMUEL WOOD, of Bradford, York. *Improvements in machinery for preparing and combing wool and other fibrous materials.* Patent dated November 8, 1854. (No. 2363.)

This invention applies to that class of preparing and combing machines known as "Preller's Cylinder or Wheel Machines" and consists chiefly of certain mechanism to be applied to the cylinder or "swift" in order to impart the requisite motion to it.

WHITEHEAD, JAMES, of Patricroft, Lancaster, spinner. *Certain improvements in self-acting mules.* Patent dated November 8, 1854. (No. 2364.)

This invention consists in certain improved combinations of machinery applicable to those self-acting mules in which a radial arm forms part of the winding-on motion, by means of which improvements the strap or chain usually employed for giving motion to the screw of the radial arm is dispensed with, and a positive motion (varying in amount according to the shape of cop required) is given to the screw at every vibration of the radial arm until the bottom of the cop is completed.

SIEMENS, CHARLES WILLIAM, of John-street, Adelphi, Middlesex, civil engineer. *Improvements in electric telegraphs.* (A communication.) Patent dated November 8, 1854. (No. 2366.)

Claims.—1. Certain described modes of constructing electric telegraphs which are capable of transmitting signals simultaneously in contrary directions by means of the same line wire. 2. Constructing transmitting instruments or "peckers" of two electro-magnets, the iron cores of one or both of which are movable within their fixed coils of wire. 3. A certain described mode of mounting and adjusting the abutments for regulating the motion of the electro-magnets or armatures of transmitting instruments and other telegraphic apparatus. 4. Preparing strips of paper or other suitable material for effecting the transmission of signals or messages by electro-magnetic telegraphs, by perforating the same with various combinations of single holes and double holes, in lieu of combinations of short and elongated holes, whereby the retarding effect of the residuary magnetism is diminished or rendered uniform. 5. Constructing machinery for perforating paper or other suitable material for telegraphic purposes with two punches so arranged that one or both may be simultaneously depressed, combined with suitable machinery for advancing the paper.

McDONALD, ALLAN, of Alexandria, Dumbarton, foreman printer, and ALEXANDER McINTOSH, of Alexandria aforesaid, mechanical engineer. *Improvements in machinery for stretching and smoothing cloth or woven fabrics preparatory to or in the course of being printed.* Patent dated November 8, 1854. (No. 2367.)

This invention consists in the application to any machine for printing woven fabrics of a self-acting tenter for stretching and smoothing the cloth before it is printed, or while it is in the act of being printed, "in which such stretching or smoothing is performed by the action of pulleys placed at the ends of a drum, or of an assemblage of drums, and rotating on the same shaft with the drums, but round axes of rotation oblique to that shaft."

NEWTON, WILLIAM EDWARD, of Chancery-lane, Middlesex, civil engineer. *An improved mode of constructing saws.* (A communication. Patent dated November 8, 1854. (No. 2368.)

Claim.—Constructing saws in such manner that each tooth shall project beyond the next one below or behind it a distance equal to the depth it is intended to cut, each tooth having its forward edge or sole parallel to the edges or soles of the other teeth.

CHAMEROY, EDME AUGUSTIN, of Paris, France, manufacturer. *Improvements in the junction of sheet-metal pipes, and apparatus employed therewith.* Patent dated November 8, 1854. (No. 2370.)

Claims.—1. The covering or lapping of metal pipes with paper steeped in bitumen or other material of a like nature for the purpose of protecting the same from the action of heat and cold. 2. The application and use of rings of cardboard, caoutchouc, gutta percha, or metal, cast or otherwise secured on to the ends of metal pipes for the purpose of forming an effective junction, &c.

CRANSTOUN, CHARLES DALRYMPLE, of Elgin, Moray, gentleman. *Improvements in coupling and uncoupling railway carriages and rolling stock.* Patent dated November 8, 1854. (No. 2372.)

This invention comprises a mode of coupling and uncoupling railway carriages and rolling stock by means of a lever shaft, actuated from the side of the carriage or wagon, and arranged to lift the engaging links on or off the hooks of the adjoining carriage or wagon; a mode of tightening up or slackening off the drawlinks of railway carriages and rolling stock by means of a transverse shaft, actuated from the side of the carriage or wagon, and connected to the drawlink by worm-wheel and screw or other suitable gearing; and the use in the coupling and uncoupling gear of railway carriages and rolling stock of jointed engaging chain links, fitted with back stop joints, so as to be rigid in one direction and flexible in the other.

PRETSCH, PAUL, of Sydenham, Surrey, photographer. *Improvements in producing copper, and plates for printing.* Patent dated November 9, 1854. (No. 2373.)

This invention "consists in adapting the photographic process to the purpose of obtaining either a raised or a sunk design on glass or other suitable material covered with glutinous substances mixed with photographic materials, which aforesaid design can then be copied by the electrotype process, or by other means for producing plates suitable for printing purposes, or can be applied for producing moulds applicable for obtaining plates."

FERRIER, DAVID, of Edinburgh, Midlothian, Scotland, bookseller. *Improvements in facilitating a reference to books.* Patent dated November 9, 1854. (No. 2375.)

This invention consists in forming on the edge of a book, without cutting or indenting it, an index to its contents which is invisible, or not conspicuous, when the book is closed, but which comes into view when the edges of the leaves are slightly spread.

PORRO, IGNACE, late colonel of engineers in the kingdom of Sardinia, director of the Optical Technomatical Institute of Paris. *Certain applications of total or partial reflection of light on transparent surfaces either alone or combined with the refraction.* Patent dated November 9, 1854. (No. 2377.)

Claims.—"1. The combined use of the refraction and reflection of light emitted from transparent bodies. 2. The mixed employment of the artificial light and of the light transmitted by objects reflected and refracted on the transparent surface of achromatic objectives and other glasses, and on the surface of transparent liquids." !

BERRY, JOHN, RICHARD BERRY, and THOMAS BERRY, the younger, all of Rochdale, Lancaster, machinists, and THOMAS ROYDS, of Salford, in the same county, manager. *Certain improvements in machinery for spinning, commonly known as mules.* Patent dated November 9, 1854. (No. 2379.)

The inventors employ a method of driving the drawing rollers during the "run in" of the carriage by connecting the front drawing rollers with the back shaft, or mangle wheel shaft (as the case may be), by a train of toothed wheels, so that motion may be communicated to the former from the latter through such train of wheels, and the front drawing rollers are thereby made to revolve one or more times during the "run in" of the carriage.

BOUSFIELD, GEORGE TOMLINSON, of Sussex-place, Loughborough-road, Brixton, Surrey. *Improvements in machinery for turning prismatic forms.* (A communication.) Patent dated November 9, 1854. (No. 2380.)

"This invention consists of an automatic combination of a cylinder of rotating cutters, mechanism for causing the same alternately to approach the block and recede therefrom, and a suitable device for the purpose of turning the block a portion of a revolution after each cut, the operations all succeeding each other in the proper order without requiring the hand of the operative except to take out the finished article and put in a new block."

TUNKS, DAVID, of Accrington, Lancaster, watch and clock-maker. *Improvements in watches, clocks, chronometers, time-pieces, and all other instruments for the measurement of time.* Patent dated November 9, 1854. (No. 2381.)

Claim.—"The entire use of the worm or

spiral for the purpose of propagating motion from one wheel to another in all clocks, watches and time-pieces, or in all instruments made and used for the measurement of time. Also to make my time-pieces to beat from sixty to two hundred beats, or more or less per minute, as the nature of the time-piece may require."

HARMAN, HENRY WILLIAM, of the Dockyard, Northfleet, Kent, civil engineer. *Improvements in windlasses, capstans, crabs, cranes, and other machines or apparatus for raising, lowering, or moving heavy bodies.* Patent dated November 9, 1854. (No. 2382.)

This invention consists in the construction of windlasses, capstans, crabs, cranes, &c., with barrels having conical surfaces capable of being brought into more or less close contact, so as to regulate the motion of the same, and thereby to regulate or wholly arrest the motion of the cable or rope employed.

SMITH, FREDERICK, of York-street, Lambeth, Surrey, oven-builder. *An improved construction of smoke-consuming furnace.* Patent dated November 9, 1854. (No. 2383.)

The inventor employs fire-bars which decrease in breadth as they approach the door, in order to increase the draught near the door. He causes currents of air to enter side flues in the walls of the furnace from the ash-pit, that in passing upwards to a horizontal flue they may become heated, and then make their escape at a horizontal opening formed in and extending across the roof of the furnace. At the sides of this opening are cheeks which project downwards into the furnace for the purpose of guiding the descending current in a vertical direction, or nearly so, on to the flame and heated gases as they pass towards the bridge. These cheeks, by offering an obstruction to the forward progress of the gases of combustion, are also intended to assist in deflecting them into the bright coals near the bridge.

ROSS, GEORGE, of Falcon-square, London, merchant. *Improvements applicable to the manufacture of articles of which caoutchouc forms a component part.* (A communication.) Patent dated November 9, 1854. (No. 2384.)

Claim.—"An improved process of vulcanizing India-rubber, or rubber once vulcanized, compounded with other articles, which process consists in heating and curing the materials whilst under pressure, and in indurating the product by the introduction of water into the press in place of the steam used for heating the pressing surfaces."

NIVEN, JAMES, gardener, of Keir, near Dumblane, Perthshire, Scotland. *The application of a new material to the manufacture of paper, and also of textile fabrics.* Patent dated November 10, 1854. (No. 2385.)

This invention consists in the application "of the hollyhock plant," or plants comprehended under the natural order "Malvacæa," to the obtainment of fibrous materials to be used for the manufacture of paper and textile materials.

LOYSEL, EDWARD, of Rue de Grétry, Paris, France, civil engineer. *Improvements in obtaining infusions or extracts from various substances.* Patent dated November 10, 1854. (No. 2387.)

Claim.—Obtaining infusions or extracts from various other substances by causing water or other liquid to ascend by hydrostatic pressure through the mass of material to be operated upon, and after properly macerating the same, to carry off the useful extractive matter from the upper part of the macerating vessel.

LÉPINE, EUGENE ANTOINE, chemist of Madrid, Spain. *Certain powders and collyrium for curing the diseases of the eyes without the use of surgical operations, to which invention he has given the name of "Lépine's Ophthalmological Powders and Collyrium."* Patent dated November 10, 1854. (No. 2390.)

The inventor describes a variety of powders composed mainly of sugar candy, extract of opium, extract of belladonna, acetate of lead, strychnine, &c., and gives directions for the preparation of the same and their application to various affections of the eyes, his object being to remove such diseases without having recourse to surgical operations.

WITTHOFF, HENRY, of Manchester, Lancaster, merchant. *Certain improvements in the construction of boats, ships, or navigable vessels, and in the means of obviating or diminishing the dangers attending accidents to the same.* Patent dated November 10, 1854. (No. 2392.)

Claims.—1. Making the bulkheads which divide the water-tight compartments of vessels, double; that is to say, each composed of two distinct partitions enclosing an intervening space. 2. Increasing the resisting power of such bulkheads by stays binding them together at various points. 3. Filling the interstitial cavities between the external sides of such double bulkheads with a substance calculated to obstruct or prevent the transition of heat and also to increase the power of the bulkhead to sustain the pressure of water. 4. The application of pipes and pumps for the purpose of introducing water into the interstitial cavities of such bulkheads. 5. The application of a lining or casing to the outer shell of the vessel enclosing an interposed material which repels water, or in some cases a heavy material to serve as ballast. 6. The use of cork as a material for filling any of the interstitial

spaces or cavities before mentioned. 7. The application of any of the aforesaid improvements separately, or of any two or more thereof in combination.

WAIN, JOHN, of Greenacres-moor, Oldham, Lancaster, mechanic. *Improvements in certain machines for spinning and doubling cotton and other fibrous substances of the kinds commonly known as mules and twiners.* Patent dated November 10, 1854. (No. 2393.)

This invention relates to the self-acting mules and twiners patented by R. Lakins and W. H. Rhodes, Oct. 12, 1849, and consists--1. In causing one half of the catch or clutch-box used by them for making the changes in the action of the mule to be connected with and to act upon the cams used for making those changes direct, and without the intervention or use of the eccentric and other mechanical agents combined therewith and described by them. 2. In an improved arrangement for putting the catch-box in gear. 3. In causing the backing-off friction-cones to be brought into contact more gradually.

RIMMEL, EUGENE, of Gerrard-street, Soho, Middlesex, wholesale perfumer. *Improvements in combining matters to be employed in coating fabrics and leather, and for other uses in substitution of India-rubber.* (A communication.) Patent dated November 10, 1854. (No. 2394.)

The inventor says, "there is to be melted in rain or in distilled water a quantity of alum and sulphate of iron, and then soap (made of seal oil and potash by preference) is added. The mixture is allowed to cool and is then washed well with pure water. The mixture is heated and evaporated briskly to a pasty state; linseed oil, which has been boiled or thickened separately, whilst still hot is mixed therewith, and then some raw or unboiled linseed oil is added."

KLOEN, WILLIAM, of Birmingham, Warwick, commercial traveller. *A new or improved method of ornamenting and attaching labels, cards, window and other bills.* Patent dated November 11, 1854. (No. 2396.)

This invention consists in ornamenting and attaching labels, cards, and window and other bills, by connecting metallic frames and ornaments to them, the said frames being perforated at suitable places when it is desired to attach the cards, &c., to any object by nailing them or sewing them upon it.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in fire-engines.* (A communication.) Patent dated November 11, 1854. (No. 2399.)

The patentee describes a fire-engine furnished with concentric cylinders, the piston working within the inner one, and the space between the two being used as an air-vessel.

FITZMAURICE, the Hon. WILLIAM EDWARD, of Hamilton-lodge, Kensington-gore, Middlesex. *Improvements in bullets, shells, and other projectiles.* Patent dated November 13, 1854. (No. 2400.)

The improved bullet or shot is made cylindrical at the sides, and tapers off to the point, having two or more faces extending from the shoulder to the point set at an angle to the direct line of flight, the pressure of the atmosphere upon these faces communicating a rotatory or spiral motion to the projectile.

GOBERT, ANTOINE EDOUARD BRISBART, of Montmirail, Marne, France. *A new kind of stamping-press.* Patent dated November 13, 1854. (No. 2401.)

This press is for printing with ink of any colour, and performs the double operation of inking and stamping by the reciprocating motion of a lever.

ARMSTRONG, JOSEPH, of the Normanton Station, Wakefield, York. *Certain improvements in chairs and crossings for the permanent way of railways.* Patent dated November 13, 1854. (No. 2402.)

This invention consists mainly in casting certain chairs, a bed plate, and a bearing piece on which the flanges of the wheel run in one piece of metal.

ABADIE, ISMAEL ISAAC, of Paris, France, gentleman. *Certain improvements in the mode of working screw propellers.* Patent dated November 13, 1854. (No. 2403.)

This invention consists in "steering vessels in any direction required, by means of a screw or other stern propeller, so mounted and adapted to the driving shaft as to be capable of being moved into a line at an angle to the line of the keel."

PÉCOUL, ADOLPHE, master-mariner, of Marseilles, France. *A new or improved system of marine log, to be called "sounding log."* Patent dated November 14, 1854. (No. 2406.)

The object of this invention is the construction of an instrument which may be used both for measuring the distances travelled over by vessels or ships of any description, and also for sounding, without stopping the ship's progress, or heaving to.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

BAXTER, FREDERICK, of Sneinton, Nottingham, silk throwster. *A compound shell to be used as a destructive projectile to be discharged from the mouth of cannon or from mortars.* Application dated November 7, 1854. (No. 2355.)

The inventor constructs a compound shell that is discharged at two separate periods, the first discharge lighting a fuse which produces the second.

GRAY, JOHN, of Edinburgh, Midlothian, Scotland, newspaper proprietor. *Improvements in ventilating hats.* Application dated November 8, 1854. (No. 2365.)

This invention consists in forming in the upper part of the hat a kind of chamber or air passage all round, into which the air from the inside of the hat may pass, and out of which it may escape through a series of perforations round the circumference of the hat.

DALGETY, ALEXANDER, of Florence-road, Deptford, Kent, engineer. *Improvements in steam boilers.* Application dated November 8, 1854. (No. 2369.)

These improvements, as applied to boilers of locomotive engines, "consist in the employment of a series of tubes which are situated in the water-space between the inner and outer casing of the fire-box, and forming a communication between the lower portion and top of the same."

BARTHOLOMEW, GEORGE, of Linlithgow, North Britain, edge-tool maker. *Improvements in boots and shoes, and other coverings for the feet.* Application dated November 8, 1854. (No. 2371.)

In carrying out this invention a thin wedge-shaped or inclined face piece of metal is attached to the face of the thin sole portion, so as to project clear of the sole or heel, and act as the internal wedge-holder of a movable wearing piece.

PALLING, FRANCIS, of Lambeth, Surrey. *Improvements in the means of preventing horses running away upon taking fright, or other causes.* Application dated November 9, 1854. (No. 2376.)

This invention is applicable both to carriage and saddle horses, and consists of a curb or check, by means of which the action of the legs of a horse may be limited to any desirable extent.

SHAW, STEPHEN, of Plaistow Marshes, Essex, boiler-maker. *An improved template for marking positions and sizes in plates or metal.* Application dated November 9, 1854. (No. 2378.)

This improved template is made of a sheet of zinc or other suitable material perforated with small holes. At each end of the perforated plate the inventor fastens a strip of hoop iron, in order to increase the strength of the template and give it the necessary degree of stiffness.

WIGGINTON, WILLIAM LAWRENCE, of Barnet, Hertfordshire. *An apparatus for cooking, heating, and ventilating, applicable to dwelling-houses, &c.* Application dated November 10, 1854. (No. 2386.)

The inventor describes a stove consisting of a large oven and a smaller one, with a small copper between them, having a rail to which kettles, &c., may be hung, and a flat cover fitted to the top of the boiler, with a pipe to carry off the steam. The front portion of the cover is to be movable, and have a square of plate-glass inserted in it to enable persons to see the operations within. The stove is furnished with two sets of bars, one a few inches above the other, the lower being used for coals, and the upper for coke.

JEAKES, WILLIAM, of Great Russell-street, Middlesex, engineer. *An improved mode of heating and ventilating by gas.* Application dated November 10, 1854. (No. 2388.)

The inventor provides a metal pipe, to which he attaches a series of parallel metal plates set at any required distance apart. To this pipe is applied a gas-burner for imparting to it heat which is taken up by, and distributed over the series of plates. This apparatus is enclosed in a case which is open at top and bottom for the passage of air, which, by coming in contact with the heated plates, will become heated, and in that state escapes into the apartment.

TURNER, EDWARD WILLIAM KEMBLE, of Praed-street, Paddington, Middlesex. *Improvements in separating liquids or fluids from substances or matters, parts of which improvements are also applicable to other purposes where the air-pump has been hitherto employed.* Application dated November 10th, 1854. (No. 2389.)

This invention consists of an extension of the principle described in former letters patent, granted to the inventor, dated January 31, 1854. See *Mech. Mag.*, vol. 61, p. 184.

ELLEN, SAMUEL, of Wick-cottage, Hackney, Middlesex. *An improved machine for washing clothes and similar articles.* Application dated November 10, 1854. (No. 2391.)

The inventor uses two vessels, one within the other, the bottom part of the interior one being made of angular bars. Within this vessel is fitted, and made to work up and down, a framework of bars corresponding to the bottom of the vessel. The clothes or other articles to be washed are placed between these two sets of bars, and are pressed and squeezed by the same movement which causes the upper framework to rise and fall.

RANSOME, FREDERICK, of Ipswich. *An improvement in preparing oxides and carbonates of lead or zinc, and carbonate or sulphate of barytes, to render the same suitable for painting or coating surfaces.* Application dated November 10, 1854. (No. 2395.)

"This invention consists in grinding and mixing oxides and carbonates of lead or zinc, and carbonate or sulphate of barytes

with soluble silica, which compound will be found very valuable for coating or painting over surfaces."

PROVISIONAL PROTECTIONS.

Dated January 19, 1855.

148. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in obtaining electro-motive power. A communication.

Dated April 18, 1855.

860. Henry Harvey, of Denbigh-street, Pimlico, Middlesex, gentleman. The application of cork in all its forms in the manufacture of beds, mattresses, cushions, and seats.

Dated April 25, 1855.

919. Henry Cockcroft, of Haslingden, Lancaster, stationer. A self-registering letter-box.

Dated May 2, 1855.

982. John Scott Lillie, Companion Order of the Bath, of South-street, Middlesex. Improvements in tents or other movable habitations.

Dated May 5, 1855.

1003. Joseph Beaumont, of Elland, Halifax, York, miller. Improvements in treating wheat meal obtained in the manufacture of flour.

1005. James Hill Dickson, of Rotherhithe, Surrey, flax manufacturer and flax machinist. Improvements in machinery for scutching and heckling flax, hemp, and other vegetable fibres.

1007. Samuel Roberts, of Hull, smith. Improvements in steam-engines.

Dated May 7, 1855.

1009. Robert Broadbent, of Staleybridge, Chester, machine maker, and Squire Farron and Benjamin Grundy, of Ashton, Lancaster, engineers. Certain improvements in steam-engines.

1011. Henri Marquis de Balestrino, of Genoa. Improvements in obtaining motive power by the aid of explosive gases. A communication.

1013. Enoch Price, of Bute Docks, Cardiff. Improvements in day-light reflectors.

1015. Robert Clark, of Gallowgate, Glasgow. Improvements in obtaining elastic finish to piece goods.

1017. Thomas Bazley, of Manchester, Lancaster, cotton-spinner. Improvements in the construction and arrangement of creels used in machines for winding, reeling, and doubling fibrous yarns or threads.

1019. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in hair and other pins, used as dress or ornament fastenings. A communication from Eugene Bourdon, of Paris, France, mechanical engineer.

1021. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in cocks and valves. A communication from Nicholas Laforest and François Eugene Boudeville, of Rheims, France, brassfounders.

Dated May 8, 1855.

1023. William Burtt Wilton, of Lowestoft, Suffolk, engineer. Improvements in furnaces for steam engines.

1024. Charles Claude Etienne Minié, of Paris, France. Improvements in muskets or portable fire-arms.

1025. Joseph Hughes, of White Hall Mills, Chapel-en-le-Frith, Derby, paper-manufacturer. Improvements in the manufacture of paper.

1026. Daniel Foxwell, of Manchester, Lancaster, card-manufacturer. Improvements in sewing-machines.

1027. Thomas Taylor Lingard, of Manchester, Lancaster, engineer. Certain improvements in presses, which improvements are also applicable to raising heavy bodies.

1028. Richard Needham, of Hollinwood, Lancaster, engineer. An improved apparatus applicable to steam boilers, for the purpose of economizing fuel, and also assisting in the generation of steam.

1029. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in machinery or apparatus for the manufacture of paper tubes to be employed in connection with spinning-machinery. A communication from Jacques Motsch, of Cernay, France, lithographer.

1030. John Allin Williams, of Baydon, Wilts, farmer. Improvements in machinery or apparatus for driving or actuating ploughs and other implements employed in working and cultivating land.

1031. James Bowron, of the Tyne and Tees Glass Works, South Shields. An improvement in the manufacture of glass tiles.

1032. Benjamin Hallewell, of Leeds, York, wine-merchant. Improvements in drying grain which has not been subjected to the process of malting.

1033. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved construction of air engine. A communication.

1034. Jules Joseph Imbs, merchant, of Brumath, French Empire. Certain improvements in manufacturing cartridges or cases for containing charges for fire-arms A communication.

1035. Thomas Williams, of Red Lion-street, Clerkenwell, Middlesex, tool-manufacturer, and John Hobson Fuller, of New Brentford, Middlesex, gentleman. Improvements in wrenches, pliers, and spanners.

Dated May 9, 1855.

1036. Robert Kanzow Bowley, of Charing-cross, Middlesex, bootmaker. Improvements in boots and shoes, and other coverings for the human foot.

1037. John Gedge, of Wellington-street South, Middlesex. An apparatus for cleansing rooms or other spaces. A communication from J. N. Truchelut, of Bésançon, France.

1038. John Gedge, of Wellington-street South, Middlesex. Improvements in the manufacture of woven or textile fabrics. A communication from J. B. N. Coupé, of St. Quentin, France.

1039. John Gedge, of Wellington-street South, Middlesex. Improvements in cases for spectacles and similar articles. A communication from J. B. Sécrétant, of Lavaux, France.

1040. Edward Cockey, Henry Cockey, and Francis Christopher Cockey, of the Frome Iron Foundry, Somerset, engineers. Improvements in clod-crushers and land-rollers.

1041. John Mayo Worrall, of Salford, Lancaster, dyer and finisher. Certain improvements in machinery or apparatus for cutting piled goods or fabrics.

1042. John Mayo Worrall, of Salford, Lancaster, dyer and finisher. Certain improvements in machinery or apparatus for cutting piled goods or fabrics.

1043. Richard Shiers Markindale, of Salford, Lancaster, worsted spinner. An improved method of removing wool from sheepskins and other peltry.

1044. Duncan Morrison, of Bordesley Works, Birmingham, Warwick. Improvements in the manufacture of metallic bedsteads, sofas, and other articles to sit or recline on.

1045. George Taylor, of Liverpool, Lancaster, merchant. Improvements in steam engine governors. A communication.

1047. Cullen Whipple, of the United States of America. Preparing and combing wool.

1048. Samuel Grainicher, of Zofingen, Switzer-

land. Certain improvements in the construction of pumps, parts of which improvements are also applicable to steam engines. A communication from Henry Tongue, of Natchez, Mississippi.

Dated May 10, 1855.

1049. Charles Mertens, of Gheel, Belgium. Improvements in breaking and scutching flax, hemp, and other fibrous matters, and in the machinery employed therein.

1050. John William Lewis, of Granby-road, Manchester, manufacturer of lightning conductors. Improvements in lightning conductors.

1051. Edwin A. Forbush, of Ashland, Massachusetts, United States of America. An improved machine for sewing leather, cloth, &c.

1052. William Scott, of Birmingham, Warwick, gun-maker, and Alfred Powell, of the same place, engineer. Improvements in apparatus or machinery to be employed for the purpose of rifling and draw-boring gun-barrels and ordnance.

1053. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved mode of preparing colours for printing and staining fabrics. A communication.

1054. Matthew Allen, of Worship-street, Middlesex, builder. An improved valve, particularly applicable for regulating the supply of air to furnaces and fire places.

1055. Edward Eastwood, of Long Eaton, Derby, engineer. Improvements in certain parts of railway carriages.

1056. Frederick William Norton, of Edinburgh, North Britain, manufacturer. Improvements in the manufacture or production of figured pile fabrics.

1057. John Harris, of Woodside, near Darlington, civil engineer, and Thomas Summerson, of West Auckland, near Darlington, ironfounder. An improvement in the manufacture of iron railway wheels.

1058. Charles Jared Hunt, of the Willows, Mitcham, Surrey. Improvements in tug and other hooks.

Dated May 11, 1855.

1059. Joseph Hallam, of Sheffield, York, needle-manufacturer, and John Elce, of Manchester, machinist. Improvements in the construction of rowels or toothed cylinders for self-acting temples and other purposes.

1060. Edward Humphries, of Pershore, Worcester, machinist, and Thomas Humphries, of the same place, machinist. Improvements in machine riddles for separating straw from grain, and for other similar purposes.

1062. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the manufacture of sulphuric acid. A communication from Jean François Persoz, of Paris, France, chemist.

1063. Constantine Henderson, of Tuffnell-park, Middlesex, gentleman. Improvements in the construction and arrangement of locks.

1064. Joseph Pascall, of Chislehurst, Kent, manufacturer, and George Fry, of Lee, in the same county, gardener. Improvements in blanching, forcing, and propagating garden-pots.

1065. James Steele, of Greenock, Renfrew, sugar refiner. Improvements in effecting the drainage of moulded sugar.

Dated May 12, 1855.

1069. Frederick George Sanders, of the Patent Architectural Pottery, Poole, Dorset. Improvements in brick, pipe and tile machines.

1070. George Robinson, of Manchester, Lancaster, machine-broker. An improved invalid's bed.

1071. John Herdman, of Belfast, Antrim, Ireland. Improvements in the manufacture of wrought-iron plates, adapted for ship-building and other purposes for which strength and lightness are required.

1072. William Bridges Adams, of Adam-street, Adelphi, Middlesex, engineer. Improvements in the construction and propulsion of vessels for navigation, moved by internal power.

1074. George Whyatt, of Openshaw, Lancaster, dyer. Certain improvements in machinery or apparatus for cutting piled goods or fabrics.

1075. John Henry Linsey, of Coleman-street, London, account-book maker. Certain improvements in account-books and other large books.

1076. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Improvements in machinery for boring or perforating stone and other materials. A communication.

1077. Florent Joseph Pieton, manufacturer, of Wignehies, French Empire. Certain improvements in knitting-machinery.

1078. William Dray, of Swan-lane, London, agricultural-implement maker. Improvements in the manufacture of frames for all kinds of structures, together with the means of fastening the same when necessary, part of which is applicable to the manufacture of screws and bolts.

1079. François Alphonse Theroulde, of Place Vendôme, Paris, shipowner. Improvements in preserving animal substances. A communication.

1080. Thomas Rickett, of Walling Works, Stony Stratford. Improvements in the construction of pressure-gauges.

1081. John Dupre, of Plymouth. Improvements in the construction of ovens. A communication.

Dated May 14, 1855.

1082. John Higgins, of Oldham, Lancaster, engineer. Improvements in steam boilers and apparatus connected therewith.

1083. William Robertson, of Edinburgh, Scotland, ironfounder. Improvements in the treatment of fuel, and its use for heating purposes.

1084. James Pettigrue, of Drumcree, Westmeath, gentleman, and Dorset-street, Dublin. Improvements in propelling vessels.

1085. Robert McConnel, of Glasgow, Lanark, ironfounder. Improvements in beams or girders for building or structural purposes.

1086. Robert Morrison, of Newcastle-upon-Tyne, engineer. Improvements in steam engines.

1087. James Buchanan, of Glasgow, Lanark, gentleman. Improvements in the manufacture of heddles or healds for weaving. Partly a communication.

1088. Thomas Charles Eastwood and Thomas Whitley, of Bradford, York, overlookers. Improvements in preparing and combing wool and other fibrous substances.

1089. John Mason, machinist, Samuel Thornton, machinist, and Leonard Kaberry, manager, of Rochdale, Lancaster. Improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning yarns or threads, and for finishing or polishing such yarns or threads.

1090. Alexander Robertson, of Sheffield, York, stove-grate manufacturer. Improvements in the construction of stoves and fire-grates.

1091. Robert Stirling Newall, of Gateshead. Improvements in apparatus employed in laying down submarine electric telegraph wires.

1092. Alfred Charles Garratt, of Massachusetts, United States of America. Facilitating the work of lubricating the axles or bearings of carriage wheels.

1093. Levi Lewis Hill, of Westhill, New York, United States of America. Improvements in silvering glass.

1094. John Lackmann, of Hamburgh. An improvement in the manufacture of sheet iron. A communication.

1095. George Tomlinson Bousfield, of Sussex-place, Brixton, Surrey. An improvement in burning hydro-carbons in lamps. A communication.

Dated May 15, 1855.

1096. Peter Christie, of Greenock, Scotland. An

improved tent or hut for soldiers in the field, emigrants, tourists, and other persons requiring a portable dwelling.

1098. William Fawcett, John Lamb, and Francis Best Fawcett, of Kidderminster, Worcester, carpet manufacturers. Improvements in the manufacture of carpets and other similar fabrics, and in machinery and apparatus to be used therein.

PATENT APPLIED FOR WITH COMPLETE SPECIFICATION.

1106. Richard Peters, of Union-street, Borough, Surrey, engineer. Improvements in steam-engines. May 16, 1855.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," May 29th, 1855.)

125. James Higgins, and Thomas Schofield Whitworth. Improvements in moulding for casting shot, shells, and other articles.

127. Edward Hall. Improvements in combining metallic wires with textile materials or fabrics for forming "wire ribbon."

143. Stanislaus Joseph Paris. Improvements in machinery for embossing.

148. Peter Armand Lecomte de Fontainemoreau. Improvements in obtaining electromotive power. A communication.

162. John Gedge. Improvements in laminating metals, either in relief or bas relief. A communication from Messrs. Tournel frères, of Saint Chamond, France.

168. François Arsène Vasnier. Certain improvements in fire-places.

172. John Coates. Improvements in railways.

180. Sir James Caleb Anderson. Improvements in steering ships.

200. Joseph Leese, jun. Certain improvements in the process of printing calicoes and other textile fabrics.

205. Robert Mallet. Improvements in the manufacture of hollow shot and shells, and similar hollow bodies of cast-iron or other cast metals.

264. Auguste Edouard Loradoux Bellford. An improved invention for constructing hulls of vessels. A communication from Virgil Putnam Corbett, of Corbett's-ville, New York.

271. Joseph Gibbons. An improvement in fixing the spindles of door-locks to their knobs.

331. Auguste Vallery. An improved machinery for the preparation of flax, hemp, and other textile materials.

335. John Henry Johnson. Improvements in governors or regulators for steam engines or other prime movers. A communication from Hippolyte Edmond Branche, mechanician, and Charles Coste, merchant, of Paris, France.

386. Frederic Prince. Improvements in firearms and ordnance.

480. Charles Iles. Improvements in apparatus for cutting, burnishing, and polishing cylindrical surfaces of metal, and other substances.

481. Charles Iles. Improvements in the manufacture of tubes, knobs, and handles of doors, rollers of castors, and reels for cotton and thread.

732. Charles Crews, and Henry George Gray. Improvements in preparing and using deodorizing or disinfecting compounds.

737. Françoise Theodore Botta. Improvements in the method and apparatus for beer brewing.

813. Joseph Revell. Certain improvements in machinery or apparatus for propelling vessels.

824. Jules Denoual. Certain improved means of enveloping medicinal preparations with soluble substances.

870. William Jones. Improvements in printing calico and other fabrics.

913. James Hunter, and George Hunter. Improvements in stone-cutting machinery.

917. Charles Piazzi Smyth. Improvements in astronomical and geodetical instruments.

931. Auguste Edouard Loradoux Bellford. Improvements in scales or machines for weighing. A communication.

979. William Banks, Henry Hampson, and John Banks. Improvements in machinery or apparatus for bleaching yarns or threads, either in the cop or hank.

1002. Robert Midgley, and George Collier. Improvements in preparing yarns for weaving and other purposes.

1003. Joseph Beaumont. Improvements in treating wheat meal obtained in the manufacture of flour.

1006. Matthew Butcher, and Thomas Henry Newby. Improvements in forge hammers.

1009. Robert Broadbent, Squire Farron, and Benjamin Grundy. Certain improvements in steam engines.

1014. Ebenezer Tyzack. An improvement in scythes.

1026. Daniel Foxwell. Improvements in sewing-machines.

1041. John Mayo Worrall. Certain improvements in machinery or apparatus for cutting piled goods or fabrics.

1042. John Mayo Worrall. Certain improvements in machinery or apparatus for cutting piled goods or fabrics.

1047. Cullen Whipple. Preparing and combing wool.

1048. Samuel Grainicher. Certain improvements in the construction of pumps, parts of which improvements are also applicable to steam engines. A communication from Henry Tongue, of Natchez, Mississippi.

1057. John Harris and Thomas Summerson. An improvement in the manufacture of iron railway wheels.

1062. John Henry Johnson. Improvements in the manufacture of sulphuric acid. A communication from Jean François Persoz, of Paris, France, chemist.

1063. Constantine Henderson. Improvements in the construction and arrangement of locks.

1064. Joseph Pascall and George Fry. Improvements in blanching, forcing, and propagating garden-pots.

1065. James Steele. Improvements in effecting the drainage of moulded sugar.

1066. David Caddick. Improvements in puddling furnaces.

1083. William Robertson. Improvements in the treatment of fuel, and its use for heating purposes.

1085. Robert McConnel. Improvements in beams or girders for building or structural purposes.

1086. Robert Morrison. Improvements in steam engines.

1087. James Buchanan. Improvements in the manufacture of heddles or healds for weaving. Partly a communication.

1092. Alfred Charles Garratt. Facilitating the work of lubricating the axles or bearings of carriage-wheels.

1095. George Tomlinson Bousfield. An improvement in burning hydro-carbons in lamps. A communication.

1106. Richard Peters. Improvements in steam engines.

WEEKLY LIST OF PATENTS.

Sealed May 25, 1855.

2499. Felix Delacour.

2524. Ellis Rowland and James Rowland.

2552. Daniel Collet.

2559. John Warhurst.

2567. Christopher Hodgson and James Whitley Stead.

2583. James Fenton.

1855.

129. Constant Jouffroy Duméry.
230. George William Henri.
581. William Lister.
582. Henry Bach.
655. William Brown.

Sealed May 29, 1855.

2543. Edward Dowling.
2572. Ferdinand Cellier Blumenthal and Maximilian Louis Joseph Chollet.
2599. François Jacquot.
2620. Peter Armand Lecomte de Fontainemoreau.
2672. Jean Baptiste Falguière.
2675. Joseph Gorton Briggs.
2677. Joseph Tucker.
2714. John Francis Porter.
2725. James Dundas.
2749. Henry Widnell.

1855.

18. John Henry Johnson.
206. John Henry Johnson.
215. William Polkinhorn.
222. John Henry Johnson.
302. Frederick Ransome.
362. John Robb and Laurence Hill.
430. William Campion.
534. Samuel Cunliffe Lister.
538. Samuel Cunliffe Lister.
548. David Hunter Brandon.
584. Robert Moore Butt.
616. Richard Edward Hodges and Charles Murray.
632. John Morrison.
638. Charles Carnell.
640. George Whyatt.
644. Charles Frederick Behn.
662. George Allam Barrett, William Exall, and Charles James Andrews.
668. Francis Crossley.
680. George Leonard Turney.
690. Thomas M'Low.
712. Joseph Morgan.
714. Edward Vansittart Neale and Thomas Dawson.
724. George Furgusson Wilson and George Payne.
734. Richard Peyton.
746. Jacob Maas and James Adams.
752. Christopher Nickels and James Hobson.
762. Denny Lane.
790. Louisa Monzani.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne Paris; Machin and Co., Dublin; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1661.] SATURDAY, JUNE 9, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

BIDEN'S PATENT IMPROVEMENTS IN FURNACES.

Fig. 1.

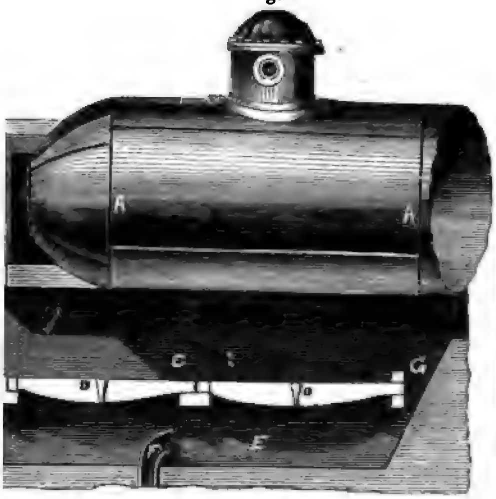


Fig. 5.

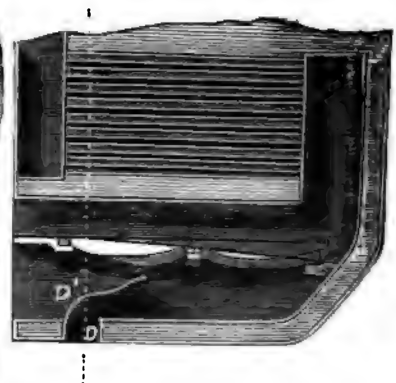


Fig. 2.

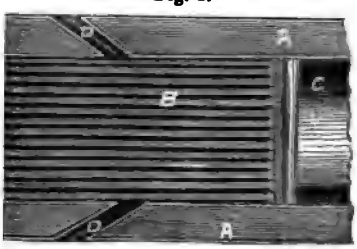


Fig. 6.

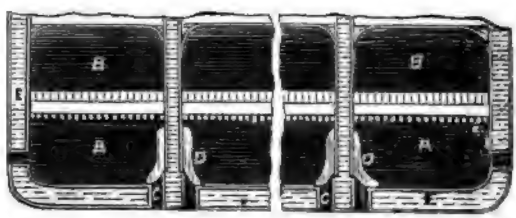


Fig. 3.

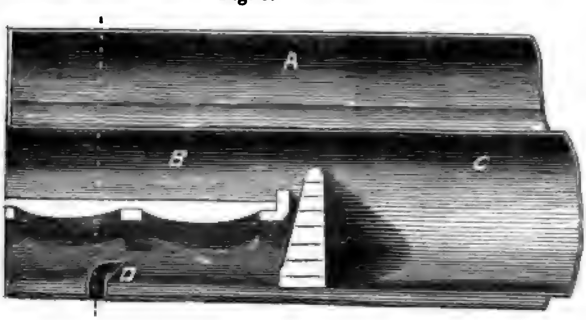


Fig. 4.

BIDEN'S PATENT IMPROVEMENTS IN FURNACES.

(Patent dated December 2, 1854.)

MR. J. BIDEN, of Gosport, has patented an invention which consists in admitting a supply of air to the sides and bottom of the ash-pits of furnaces, in addition to the ordinary supply, and which is applicable to furnaces generally, the arrangements being modified to suit any particular construction of furnace. "The manner of carrying out my invention," says the patentee in his specification, "is as follows:—The furnace is made sufficiently long from the front to the back to admit of the red hot fuel occupying the back half of the fire-bars and the fresh or unburnt fuel the front half of the fire-bars. The ash-pit is supplied with a sufficient quantity of air to produce complete combustion by free admission in front, and by an opening or openings in the side or the bottom of the ash-pit, which opening or openings is or are supplied with air from the front, or the sides, or the back of the furnace by an air flue or flues. The air supplied by the aforesaid opening or openings is directed onwards from the front at which it enters towards the end of the ash-pit, either by arranging or constructing the opening or openings so as to direct the air to the required point, or by a metal tube or tubes, or a deflecting plate or plates. Provision is made for causing the air thus supplied to pass onward from the end of the ash-pit into the ascending flue to the chimney, either through the fire-bars, or through or behind the bridge, or through an opening beyond the fire-bars, and between them and the bridge. It will be generally advisable to adapt a tube or tubes, or a deflecting plate or plates, to the opening or openings through which air is supplied to the ash-pit, as before mentioned, in order to prevent any dust or ashes from entering into the air flue or flues and thereby obstructing the admission of air."

Fig. 1 represents an ordinary cylindrical boiler, with Mr. Biden's arrangement for admitting the air to the furnace applied to it. A A is the boiler set in the brickwork, B; C is the furnace, and D the fire-bars. E is the ash-pit which is open at front for the admission of air to the furnace. F is an air-pipe which is open to the external atmosphere and conveys the air into the furnace below the fire-bars. The position of this air-pipe is before the back half of the fire-bars, and it is so placed as to direct the air towards the fire-bridge, in order to cause a current of air to mix with the gases and products of combustion at that part, so as to insure a more perfect and free consumption of them. A space, G, is left between the end of the fire-bars and the bridge to admit of a free passage of the air. Fig. 2 represents a sectional plan of a Cornish boiler, in which the air to the furnace is admitted through the sides of the boiler. A A is the boiler; B, the furnace; C, the flue. D D are the air passages, which are inclined at the angle shown, in order to deflect the air towards the back end of the furnace. Fig. 3 represents a longitudinal section, and fig. 4 a cross section of a similar Cornish boiler, in which the air is admitted from the bottom and through the air-tubes, D D. Fig. 5 is a section of a marine boiler, in which the air is caused to pass through the openings, D D; and by means of the deflecting plate, D′, the air is caused to impinge upon the back of the furnace, and there to unite with the products of combustion. Fig. 6 represents a cross section of a set of furnaces for marine boilers: A A is the ash-pit; B B are fire-bars; C C, air-tubes or passages; D D, deflecting plates to keep the air passages free from ashes. The side air-passages do not require any protecting plates. E E are water spaces. The inventor supplies the air-passages with air through a channel or channels made between the bottom of the furnaces and the stoker's floor, the air being introduced into these channels from some source other than that which is usually employed for supplying the ash-pit.

NEW SOLUTION OF A CUBIC EQUATION.

Let $$x^3+3px^2+3qx+r=0 \quad\ldots\ldots (1)$$

Assume $$l(x+p-k)^3-k(x+p-l)^3=0 \quad\ldots\ldots (2)$$

or $$x^3+3px^2+3(p^2-kl)x+p^3-3pkl+kl(k+l)=0,$$

by expanding and dividing by coefficient of x^3.

Equating to (1) we have

$$kl=p^2-q, \quad p^3-3pkl+kl(k+l)=r$$

or $$kl=a, \quad (k+l)a-2(pa-c)=0, \quad \text{if } p^2-q=a, \quad pq-r=2c,$$

$\therefore$ ak, al are the roots of $y^2-2(pa-c)y+a^3=0 \quad\ldots\ldots (3)$.

From (2), $$l^{\frac{1}{3}}(x+p-k)-\alpha k^{\frac{1}{3}}(x+p-l)=0, \text{ where } \alpha=1^{\frac{1}{3}},$$

and dividing by coefficient of x,

$$-x=p+(kl^2)^{\frac{1}{3}}\alpha+(k^2l)^{\frac{1}{3}}\alpha^2$$

$$=p+(al)^{\frac{1}{3}}\alpha+(ak)^{\frac{1}{3}}\alpha^2, \text{ since } kl=a,$$

ak, al are known from (3).

The single assumption here made, though extremely arbitrary, appears to give this method a slight advantage over Cardan's, which requires two.

W. Rotherham.

ON EARTH-BORING MACHINERY.

A paper descriptive of the various modes of earth-boring for the sinking of wells and other similar purposes, was read on the evening of Wednesday, May 30, at the Society of Arts, by Mr. Colin Mather. After describing the ordinary boring apparatus, alluding to the absence of satisfactory information respecting the plan brought before the British Association by Mr. Vignoles —and pointing out the peculiarities of the system adopted by MM. Degousée in the boring of a well at Highgate, the author proceeded, as follows, to describe the method employed by himself and Mr. Platt.

The construction of the boring-head and shell-pump, and the mode of acquiring the percussive motion, constitute the chief novelties of the system and machine. The couple-cylinder engine, with the reversing or link motion, is used for winding and lowering apparatus, but an ordinary winding engine, similar to those used in collieries, may be applied.

The boring-head consists of a wrought-iron bar, about eight feet long, on the lower part of which is fitted a block of cast-iron, in which the chisels or cutters are firmly secured. Above the chisels an iron casting is fixed to the bar, by which the boring-head is kept steady and perpendicular in the hole. A mechanical arrangement is provided, by which the boring-head is compelled to move round a part of a revolution at each stroke. The loop or link by which the boring apparatus is attached to the rope is secured to a loose casting on the wrought-iron bar, with liberty to move up and down about six inches. A part of this casting is of square section, but twisted about one-fourth of the circumference. This twisted part moves through a socket of corresponding form on the upper part of a box, in which is placed a series of ratchets and catches, by which the rotary motion is produced. Two objects are here accomplished —one, the rotary motion given to the boring-head; the other, a facility for the rope to descend after the boring-head has struck, and so prevent any slack taking place, which would cause the rope to dangle against the side of the hole, and become seriously injured by chafing.

The shell-pump is a cylinder of cast-iron, to the top of which is attached a wrought-iron guide. The cylinder is fitted with a bucket similar to that of a common lifting pump, with an India-rubber valve. At the bottom of the cylinder is a clack, which also acts on the same principle as that in a common lifting-pump, but it is slightly modified to suit the particular purpose to which it is here applied. The bottom clack is not fastened to the cylinder, but works in a frame attached to a rod which passes through the bucket, and through a wrought-iron guide at the top of the cylinder, and is kept in its place by a cotter,

which passes through a proper slot at the top of the rod. The pump-rod, or that by which the bucket is worked, is made of a forked form, for the twofold purpose of allowing the rod to which the bottom clack is attached to pass through the bucket, and also to serve as the link or loop by which the whole is suspended.

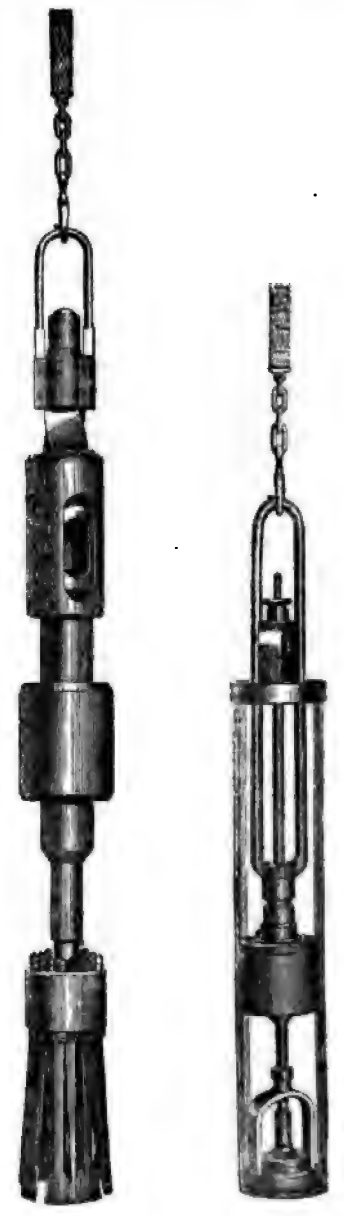
The wrought-iron guide is secured to the top of the cylinder, and prevents the bucket from being drawn out when the whole is so suspended. The bottom clack also is so arranged that it is at liberty to rise about six inches from its seating, so as to allow large fragments of rock, or other material, to have free access to the interior of the cylinder when a partial vacuum is formed there by the up-stroke of the pump.

The percussive motion is produced by means of a steam cylinder, which is fitted with a piston of 15 inches diameter, having a rod of cast-iron 7 inches square branching off to a fork in which is a pulley of about three feet in diameter, of sufficient breadth for the rope to pass over, and with flanges to keep it in its place. As the boring-head and piston will both fall by their own weight when the steam is shut off, and the exhaust valve opened, the steam is admitted only at the bottom of the cylinder; the exhaust-port is a few inches higher than the steam-port, so that there is always an elastic cushion of steam of that thickness for the piston to fall upon.

The valves are opened and shut by a self-acting motion derived from the action of the piston itself, and as it is of course necessary that motion should be given to it before such a result can ensue, a small jet of steam is allowed to be constantly blowing into the bottom of the cylinder; this causes the piston to move slowly at first, so as to take up the rope, and allow it to receive the weight of the boring-rod by degrees, and without a jerk. An arm which is attached to the piston-rod then comes in contact with a cam, which opens the steam-valve, and the piston moves quickly to the top of the stroke. Another cam, worked by the same arm, then shuts off the steam, and the exhaust-valve is opened by a corresponding arrangement on the other side of the piston-rod. By moving the cams the length of the stroke can be varied at the will of the operator, according to the material to be bored through. The fall of the boring-head and piston can also be regulated by a weighted valve on the exhaust-pipe, so as to descend slowly or quickly, as may be required.

The general arrangement of the new machine may be described as follows:

The winding drum is 10 feet in diameter, and is capable of holding 3,000 feet of rope, 4½ inches broad and half an inch thick; from the drum the rope passes under a guide pulley, through a clam and over the



BORING HEAD. SHELL PUMP.

pulley which is supported on the fork end

of the piston-rod, and so to the end which receives the boring-head, which being hooked on and lowered to the bottom, the rope is gripped by the clam. A small jet of steam is then turned on, causing the piston to rise slowly until the arm moves the cam, and gives the full charge of steam; an accelerated motion is then given to the piston, raising the boring-head the required height, when the steam is shut off, and the exhaust opened in the way described, thus effecting one stroke of the boring-head as regulated by a back pressure valve in the exhaust pipe. The exhaust-port is six inches from the bottom of the cylinder; when the piston descends to this point it rests on a cushion of steam, which prevents any concussion. To increase the lift of the boring-head or compensate for the elasticity of the rope, which is found to be one inch in 100 feet, it is simply necessary to raise the cams on the cam shaft whilst the percussive motion is in operation. The clam which grips the rope is fixed to a slide and screw, by which means the rope can be given out as required. When this operation is completed, and the strata cut up by a succession of strokes thus effected, the steam is shut off from the percussive cylinder, the rope unclamped, the winding engine put in motion, and the boring-head brought up and slung from an overhead suspension-bar by a hook fitted with a roller to traverse the bar. The shell-pump is then lowered, the *débris* pumped into it, by lowering and raising the bucket about three times, which the reversing motion of the winding engine readily admits of; it is then brought to the surface and emptied by the following very simple arrangement. At a point in the suspension-bar a hook is fixed perpendicularly over a small table in the waste tank, which table is raised and lowered by a screw. The pump being suspended from the hook hangs directly over the table, which is then raised by the screw till it receives the weight of the pump. A cotter, which keeps the clack in its place, is then knocked out, and the table screwed down. The bottom clack and the frame descending with it, the contents of the pump are washed out by the rush of water contained in the pump cylinder. The table is again raised by the screw, and the clack resumes its proper position; the cotter is then driven into the slot, and the pump is again ready to be lowered into the hole as before. It is generally necessary for the pump to descend three times in order to remove all the *débris* broken up by the boring-head at one operation.

The following facts obtained from the use of the machine in boring in the new red sand stone at Manchester, will show its actual performance, and enable us to compare it with the other systems mentioned in this paper. The boring-head is lowered at the rate of 500 feet a minute; the percussive motion is performed at the rate of 24 blows a minute, and being continued for ten minutes, the cutters in that time penetrate from 5 to 6 inches; it is then wound up at 300 feet a minute. The shell-pump is then lowered at the rate of 500 feet a minute, the pumping continued for one minute and a half, and being charged, the pump is wound up at 300 feet a minute. It is then emptied and the operation repeated, which can be accomplished three times in ten minutes, at a depth of 200 feet. The whole of one operation, resulting in the deepening of the hole 5 to 6 inches, and cleansing it of *débris* ready for the cutters or boring-head being again introduced, is seen to occupy an interval of twenty minutes only. The value of these facts will be best shown by comparing them with the results by the old method.

At Highgate the boring has occupied two years in attaining a depth of 680 feet from the bottom of a well 500 feet deep from the surface. Their progress at present is at the rate of 6 inches per week, working night and day. At Warwick, thirteen months were occupied in boring 400 feet through red marl. At Saltaire, two years in going 80 yards.

One well-known defect of the old method of boring consists in the 'buckling' and dangling of the rods, which has the effect of enlarging the hole in some instances to a diameter of four feet where soft strata intervene. This arises from the buckling and dangling of the rods causing them to strike against the sides of the hole, and breaking off portions of earth which fall to the bottom, thus considerably increasing the quantity of *débris* to be brought up by the shell, and occupying an immense time in getting out the *débris* which has merely fallen from the side, without increasing the depth of the hole. This is a serious defect where geological purposes are to be served by the boring, because the earth from the side falling to the bottom of the hole mixes with that which is cut up by the chisel, and thus prevents an accurate knowledge being obtained of the strata which the boring has penetrated. It must be remarked also that the defect of buckling is to crystallise the iron, deteriorating its quality, and thereby causing those frequent breakages which retard progress, and add so materially to the expense of this system of boring. The process of crystallisation being beyond the observation of the workmen, the result is scarcely if ever known till the breaking of the rods reveals it. To remedy this difficulty, and obviate the effects of buckling, it has been found necessary to

put down iron tubes into the bore-hole. As the first length of these tubes can scarcely be got to a depth of more than 200 feet, on account of the great external friction, it is necessary, when the tube has to be carried to a further depth, to put down a second and a third length of tube, and as each length must come to the surface, the diameter of the bore-hole is very materially diminished. It will easily be seen that when the bore-hole is required to be of considerable depth, this diminution of its diameter will at length so contract the hole as to render the supply of water comparatively limited, and in fact to threaten the design with actual failure after a vast outlay has been incurred. These inconveniences, so serious in character, are all obviated by the new method of boring. No rods are used, and as the rope which is substituted for them seldom comes in contact with the sides of the hole so as to disturb the strata, tubing will rarely be required. Indeed, it will only be necessary when the particular strata through which the hole passes happens to be very fluid, and even then it will not always be wanted. The great power of pumping and the facility of winding possessed by this new machine would enable it to exhaust any ordinary quicksand which might find its way into the hole. The pumping process could be carried on at a depth of 500 feet at the rate of a cart-load per hour. It is possible with the improved machine to cleanse the hole so effectually that not a loose particle remains at the bottom. This will at once be seen from the fact that the pump has sufficient power to draw in masses of rock or other substances of from three to four pounds weight. This circumstance renders the machine particularly useful in geological researches, inasmuch as the lowest strata are brought up in a state of the greatest possible compactness and purity, notwithstanding any admixture of earth from the sides, or of that which the shell has been unable to bring up in the previous operation.

Some of the more important public uses to which the new machine can be applied may now be briefly enumerated.

Sanitary questions deservedly occupy at the present time a large share of public attention. Water, as is well known, is the chief agent in sanitary reform. It is necessary for flushing sewers, for supplying baths and washhouses, as well as for meeting the domestic wants of all classes of the community. The importance of cleanliness cannot be overrated, as a means of promoting the general health, and it imposes the necessity for a much more copious supply of pure water than is as yet enjoyed in most towns. Many small towns which are so situated that they cannot command a supply of water from natural sources, are prevented from obtaining it by boring, on account of the great expense, and still more the vexatious uncertainty of the process. The corporation of Manchester have expended upwards of a million sterling in supplying that city and its neighbourhood with water, and they sell it to the corporation of Salford at the rate of threepence per thousand gallons. It is confidently believed that by the new method of boring an abundant supply of water could be procured on the spot at half that price. Thus, in a sanitary point of view, the new machine is of the utmost value, since it enables us to procure a much greater supply of water in far less time, and from depths which were all but inaccessible on the old method of boring. For example, the work at Highgate, which has occupied two years, could have been done in thirty-three days. That at Warwick, which has occupied thirteen months, could have been done in twenty days. That at Saltaire to supply the work people with drinking water, which has occupied two years, could have been done in twenty-nine days.

It must be borne in mind that water is seldom sought by the tedious and expensive process of boring till it is urgently wanted. The old method, therefore, not only occasions a vastly increased outlay, but also involves an amount of privation which in many cases is a matter of serious importance.

In conclusion, another important use may be noticed to which this invention may be applied, namely, the ventilation of mines, with a view of preventing the dreadful explosions which are unhappily too frequent. These explosions most frequently arise from the ignition of the gases or foul air accumulated in the galleries, or old workings, and in large cavities which have been partitioned off. The remedy in these cases would be to bore down from the surface and perforate these parts of the mine at different places, so as to admit a current of fresh air into the parts where the foul air had accumulated. On the old method of boring this object is impracticable, since, in addition to the expense, the diameter of the hole within reach of the old system is quite insufficient for the purpose required. The improved plan now proposed is not only (as has been shown) much more economical, but it is capable of boring holes of ample dimensions to be adapted as air-shafts in the way proposed. A diameter of three feet has been suggested above, but the largest practicable limit is much beyond this. Instead of partitioning off the winding shaft, and connecting it below with a complicated system of passages for return currents, it would be

found in practice much more useful to bore several holes, of a moderate diameter, at the end of the workings. On this plan the air would have only half the distance to travel, and the ascending shaft would not require to be kept at nearly so high a temperature, or, if kept at the same temperature, the ventilation of the mine would become so much the more effective and complete.

It is hoped that the facts contained in this paper will sufficiently prove the vast superiority of the new method of boring herein described, and the great advantage which will accrue to the community from its general adoption. Relying upon these facts it is presumed by the inventor that the improvements he has introduced will constitute a new era in the art of earth-boring, and in the various important objects to which it is and may be applied.

ON THE ELECTRO-CHEMICAL DEPOSITION OF METALS.

BY ALEXANDER WATT.

(*Continued from page 508.*)

There are other circumstances besides the power of the battery, which affect the nature of the deposit or the speed with which it is obtained. The solution, or *electrolyte*, may be what is termed a *good* or a *bad* conductor, according to the amount of metal or the proportion of the solvent existing in it; or the extent of surface of anode or positive electrode immersed in the solution while deposition is taking place. If the solution be poor in metal, &c., and the surface of anode exposed to the article which is to receive the deposit be smaller than is required, the operation will go on slowly; whilst, on the other hand, a superabundance of metal and the solvent being in the solution, and the surface of anode exposed being considerable, the deposit may take place so rapidly that it will be thrown off the cathode in the form of a powder, or myriads of minute granules.

Again, the speed with which the deposit is obtained depends upon the temperature of the solution. When the solution is raised to the temperature of 60° C. (140° F.) deposition takes place very rapidly; indeed, in order to bring the solution to a strength which will enable you to use it hot without fear of granular deposition and other imperfections, nearly 75 per cent. of water must be added to it, and the surface of anode immersed be diminished.

In excessively cold weather, I have frequently found a silver solution covered with ice of considerable thickness, and, consequently, the deposition has taken place more slowly than was desired. In this state the deposit was much harder and less inclined to be "rough," than when the solution was of a higher temperature. I would at all times prefer working the silver solution at as low a temperature as possible, as I think the deposit, under such circumstances, is in many respects of a superior quality.

Motion will also materially affect electro-deposition. If the solution be too strong; if the surface of the anode exposed be excessive; if the solution be of too high a temperature; if the battery be too powerful, or if any one of these circumstances give rise to a pulverulent or granular deposit, or cause the metal to "strip," or peel off the article on which it is deposited; by keeping the negative electrode and the article attached to it in constant and rapid motion until the required coating is obtained, a perfectly smooth, uniform and tenacious deposit will be secured, though the circumstances referred to be ever so unfavourable. For example, if you attach an article to the negative electrode and place it in the gilding bath, and if after a few seconds, you observe that the gold is deposited of a dull brown colour, by very briskly agitating the article in the solution, it will instantly become bright and of a good fine-gold colour.

There are circumstances under which no deposition whatever will take place. The following occurrence will illustrate a curious phenomenon which occurred to my brother and myself some years ago. We had been plating large quantities of spoons and forks in an apartment for several years, during which time our operations had been most highly successful, and we had been much praised for the quality of our deposit. One day my brother found, to his great annoyance, that no deposit whatever would take place on any article immersed in the solution. Something was wrong. Entirely new batteries were applied, but with no better success; fresh solutions were made, but still no deposition of silver took place. The batteries and solutions were next insulated from contact with the ground, as we thought it probable the current was being conducted away some how or other, and yet no favourable change occurred. Thus matters went on for nearly a fortnight—all hands were idle; the workpeople enjoyed a kind of extended Easter holiday, or were hoping something favourable would "turn up," from day to day. At last, having tried every expedient that suggested itself to our almost distracted senses, it occurred to me that if the solutions and batteries were removed to

another apartment we might meet with better success. The experiment was tried, and it succeeded. Once more we could observe the beautiful deposit of silver upon the metallic surfaces, and all went on well.

Whatever may have been the cause of this inaction, some time afterwards, the operations were carried on in the same apartment with perfect facility.

In practising the art of electro-deposition it is necessary to observe the strictest cleanliness, and to be careful not to allow the solutions in any way to be mixed with each other.

It will be necessary to have various kinds of solutions of certain strengths, in order to deposit one metal upon another with tenacity and firmness. The same solution will not do well for all metals. It is the neglect of this fact which causes many failures, and many solutions to be spoilt. A solution which will allow a good deposit of silver to take place on copper or brass, will not be applicable to steel, as the silver would instantly blister or peel off the latter. Again, a solution which would deposit a faultless coating of copper on iron would deposit a very bad coating on zinc.

To those who are unacquainted with science, I may observe that they need not be deterred from the study of these arts by any apparent abstruseness which may, at first sight, surround it. In the present portion of my article I have been under the necessity of entering chiefly into scientific considerations: in the next, I shall commence the details of the various processes of electro-deposition, which I will endeavour to render as simple as possible, in order that they may be fully understood even by those who now enter upon the study of this subject for the first time.

• • • •

Many valuable improvements and additions have been made by the various manipulators in this beautiful art; one of the first of which was Mr. Murray's application of plumbago (carburet of iron), as a coating for surfaces which were non-conductors of electricity. This important discovery at once rendered the art of electrotype simple and practicable.

Electrotypes were originally produced in a cell, which formed at the same time the battery and the decomposition bath, thus:—A jar was charged with a concentrated solution of sulphate of copper ("blue stone" or "blue vitriol"). A porous cell, a bladder, or a glass tube having one end covered with a piece of bladder, was placed in this solution, and a piece of zinc with a copper wire attached was placed in this cell, which was then filled with dilute sulphuric acid or salt and water; the object to be copied, being previously prepared, was suspended to the end of this wire and immersed in the copper solution. This was termed the "single cell" arrangement; it is even now frequently used by electro-metallurgists in some of their operations.

Subsequently, experimentalists applied a separate battery for the purpose of depositing copper from its solution, and it was found that operations on a large scale could thus be carried on with considerable speed and with other advantages. Mr. Mason has the credit of being the first who applied a separate battery to the production of electrotypes.

When a separate battery is used, it is necessary to attach the mould to be copied to the negative electrode,—the wire proceeding from the zinc of the battery, and a piece of sheet copper is attached to the positive electrode,—the wire issuing from the copper of the battery. In this arrangement the object to receive the deposit constitutes the *cathode* and the copper plate the *anode*.

Copper Solutions.—The solution for electrotyping by means of the "single cell" arrangement, should be composed of a nearly saturated solution of sulphate of copper, with two ounces of concentrated sulphuric acid added to the gallon of saturated solution; one drachm of arsenious acid (white oxide of arsenic) may be also added to improve the character of the deposit, but this is not indispensable. A little chloride of tin may be substituted for the arsenic.

The sulphate of copper may be dissolved in boiling distilled or rain water, and allowed to cool, the sulphuric acid being added when the solution is quite cold.

Sulphate of copper is frequently adulterated with sulphate of iron ("copperas" or "green vitriol"), therefore it is necessary to obtain the article at a respectable establishment; in fact it is advisable always to procure substances required for experiment, or even for more extensive operations, where their purity can be depended upon. If every one adopted this principle, those who vend impure materials would soon be compelled to follow the example of their more honest competitors, and to sell pure articles, however little in accordance with their wishes.

The solution required for depositing copper with a separate battery is composed of—

Sulphate of copper . . .	1 pound.
Sulphuric acid	1 pound.
Water . . . . (about)	1 gallon.

to which may be added a small quantity of arsenious acid or chloride of tin.

ON THE SLIP OF SCREW PROPELLERS.

In 1845, M. Bourgois, Engineer de Vaisseau, at the Government Manufactory of Indret, in France, made a number of experiments with screw propellers of different forms and dimensions. In consequence of his having been supplied with manual force only, he was not, it appears, enabled to embrace the whole of the circumstances attending the use of the screw, but was obliged to address himself entirely to the question of slip. The results of his experiments have been made the subject of an interesting paper by Mr. B. F. Isherwood, Chief Engineer, United States Navy, whose remarks are in course of publication in the *Journal of the Franklin Institute*. After an elaborate examination of the data furnished in the report of Bourgois, Mr. Isherwood considers the experiments discussed establish the following conclusions with regard to "the laws regulating the slip of the screw in function of its form and dimensions."

1. *With regard to the influence exerted on the slip by the cutting out of the inner part of the blades.* That a cutting out of the inner portion of the blades, by the passage of a cylinder having the same axis with the screw and a diameter equal to half the diameter of the screw, increased the slip one-seventh; that is to say, if the slip before the cutting out was 28 per centum, it would be 32 per centum after the cutting out. Also, that a further cutting out of the inner portion of the blades, by the passage of a cylinder of coincident axis and of a diameter equal to three-fourths the diameter of the screw, increased the slip two-fifths; that is to say, if the slip of the full threaded screw before the cutting out was 28 per centum, it would be 39 per centum after the cutting out.

2. *With regard to the influence exerted on the slip by employing less than one convolution of the thread, or by fractioning the pitch.* That supposing the original screw to consist of one convolution of the thread divided into several blades, the effect upon the slip is the same for equal fractionments of the pitch, whether that fractionment be effected by the omission of blades, preserving the same length of screw, or by the diminution of the length of the screw, preserving the same number of blades, viz., that an increase of slip follows each decrease of screw surface; that this increase of slip follows no regular ratio of the decrease of surface of the screw, but is large for small fractions of the pitch, becoming gradually very small for large fractions of the pitch; that the mean of the experiments determines the following for the ratio of the increase of slip in the case where the original one convolution of the thread was decreased successively by one-seventh at a time, viz.:

Fractions used of the pitch.	Ratio of the increase of the slips.	Relative slips, supposing the slip with one convolution of the thread to be 30 per centum.
7-7 or 1·000	1·0000	30·000
6-7 or 0·857	1·0024	30·072
5-7 or 0·714	1·0369	31·107
4-7 or 0·571	1·0777	32·331
3-7 or 0·429	1·1492	34·476
2-7 or 0·286	1·2626	37·878
1-7 or 0·143	1·4463	43·389

That within the limits of one convolution of the thread and with the same screw, halving the same surface either by reducing the length one half or by omitting one-half the number of blades, increases the slip in the same ratio, and this ratio is constant, be the absolute amounts of surface what they may; and that the ratio of this increase of slip for such a reduction of one-half the surface is 1·151 or two thirteenths: for instance, if using *six*-sevenths of one convolution give a slip of 30 per centum, then using *three*-sevenths of the same convolution will give a slip of ($1·151 \times 30 =$) $34\frac{1}{2}$ per centum; if using *two*-sevenths of one convolution give a slip of 39 per centum, then using *one*-seventh of the same convolution will give a slip of ($1·151 \times 39 =$) 45 per centum, and so on.

3. *With regard to the influence exerted on the slip by employing an oblique generatrix.* That the employment of a straight line for generatrix, having its inner end tangent to an inner cylinder of the same axis as the screw, so that it made angles of 100° and 80°, with a plane passing longitudinally through the axis, exerted no sensible influence on the slip of the screw; and as a curved generatrix is only an oblique generatrix with a constantly varying degree of

obliquity, it follows that no sensible influence on the slip would be exerted by a curved generatrix.

4. *With regard to the influence exerted on the slip by employing a curved directrix or expanding pitch.* That the employment of a curved directrix with such a degree of curvature that the tangents at the extremities of the blade made angles of 8° with the chord, decreased the slip of the screw one-sixth; that is to say, if a screw with a straight directrix or uniform pitch gave a slip of 30 per centum, then the same screw but with a curved directrix whose mean pitch equalled the pitch of the straight directrix, would give a slip of 25 per centum; the curvature of the directrix being as above described and the slip being calculated for the mean pitch.

5. *With regard to the influence exerted on the slip by the division of the same propelling surface into a more or less number of blades.* That the slip of the same area of the same propelling surface remains unaltered, whether that surface be arranged in one blade or many.

6. *With regard to the trepidations of the screw.* That when the propelling surface is arranged in *one* blade, the trepidations are *very strong*; when arranged in *two* blades, *light*; when arranged in *three* blades, *nearly insensible*, and when in *four* blades they entirely *ceased*.

7. *With regard to the influence exerted on the slip by the greater or less rotary speed of the same screw.* That the slip of the same screw remained constant at all rotary velocities, the speed of the boat being in the direct ratio of the number of revolutions made by the screw in a given time.

8. *With regard to the influence exerted on the slip by surrounding the periphery of the screw with a thin metallic drum of the same length as the screw, fastened to the blades and turning with them.* That the application of such a drum produces no effect on the slip.

9. *With regard to the influence exerted on the slip by arranging the blades checkerwise.* That the arrangement of the blades checkerwise, which is done by taking half the number of the blades, moving them back their length, and positioning them so that the rear blades intersect the spaces between the front blades, which arrangement causes the screw to be of double length in the direction of the axis, exerts no influence on the slip of the screw.

10. *With regard to the influence exerted on the slip by the length of the pitch.* That the slips of otherwise equal screws are in the direct ratio of the pitches; that is to say, doubling the pitch doubles the slip.

11. *With regard to the influence exerted on the slip by the length of the diameter of the screw.* That the slips of otherwise equal screws are in the ratio of the squares of the diameters; that is to say, halving the diameter increases the slip four times.

PROFESSOR CALLAN'S PATENT IMPROVEMENTS IN GALVANIC BATTERIES.

[The following is an exact copy of the specification of Professor Callan's last patent for improvements in galvanic batteries and exciting agents.]

My invention of "improvements in exciting agents used in galvanic batteries, and in the construction of galvanic batteries," consists, in the first place, in the use of new exciting agents for the positive and negative elements, or for the negative element only, of nearly all galvanic batteries in which zinc is the positive and another metal or carbon is the negative element.

These new exciting agents are the following:—1st. Undiluted muriatic acid, whether used alone or with sulphuric or certain other acids, such as pyroligneous manganic acid, &c. 2ndly. Muriatic or sulphuric acid, or both together, mixed with any quantity of water of any kind, provided that quantity be less than five or six times the quantity of the acid or acids; that is to say, less than five times for some batteries, and less than six times for others. The batteries in which the quantity of water should be less than five times that of the acid or acids are those in which platina, copper, silver, carbon, or a platinized metal is the negative element; and the batteries in which the quantity of water should be less than six times that of the acid or acids are those in which iron or cast-iron is the negative element.

I would here remark, that for exciting the zinc or positive element I do not use the mixture composed of ten parts of sulphuric acid, and fourteen parts of muriatic acid diluted with twenty parts of water. I would also remark, that if the negative element be excited by any of the above-mentioned fluids, and the positive element by a different fluid, the elements must be separated by a porous diaphragm.

My invention consists, secondly, in using cast-iron cells (that is, cast-iron vessels which will hold the exciting fluid), made in such a way that both sides of the zinc plates within them will act, and that the distance between the zinc and iron, or between the greater part of their respective surfaces, will not exceed a quarter or five-sixteenths of an inch, unless the surface of the zinc plates exceed thirty-six square inches; also in covering the part of the iron or zinc,

which has little or no effect in producing the galvanic current, with a substance on which the exciting fluid will not act, or will act but slightly, and thus preventing or diminishing the action of the fluid on that of the iron or zinc. The cast-iron cells or vessels which hold the exciting fluid should be so narrow, except at the upper part, that when the zinc plates are placed in the middle of them the distance between either side of the zinc plate and the side of the cast-iron cell nearest to it may not exceed a quarter of an inch. By this arrangement each side of the zinc plates will be opposite and contiguous to an equal or not very unequal surface of cast-iron.

The upper part of the cells should be wider than the lower part, in order that they may contain a sufficient quantity of the exciting fluid. In order to give an idea of the proportion of the width of the upper and lower part of the cell I would remark, that for about the length of an inch from the top the width of the cell may be about an inch greater than at the lower part, assuming the cells to be about four or five inches high; but if the cells be more than six inches high, the widened part may extend further from the top of the same. I do not, however, confine myself to these exact proportions.

In order to prevent or diminish the action of the fluid on that part of the iron or zinc which has little or no effect in producing the galvanic current, I cover it with a substance on which the exciting fluid will not act, or will act but little, such as wood, vulcanised India-rubber, or other substance calculated to produce a similar effect.

Having thus described the nature of my invention, and in what manner the same is to be performed, I would have it understood that what I claim as of my invention is,

First. The use of the exciting agents described under the first head of my invention.

Secondly. The use of the cast-iron cells of the form described, so as to combine the means of holding a sufficient quantity of the exciting fluid with the action of both sides of the zinc, and with contiguity of the surfaces of the sides of the cells to the surfaces of the zinc plates.

And lastly. The protection of that part of the cast-iron which has little or no effect in producing the galvanic current, by covering it with a substance on which the exciting fluid will not act at all, or will act but little.

PEILE'S PATENT LIFTING-JACK.

The accompanying engravings represent an improved lifting-jack, patented April 11, 1854, by Mr. J. J. Peile, of Whitehaven, which is intended to be mainly employed in stapling timber in the holds of vessels. Fig. 1 represents a front, and fig.

Fig. 1.

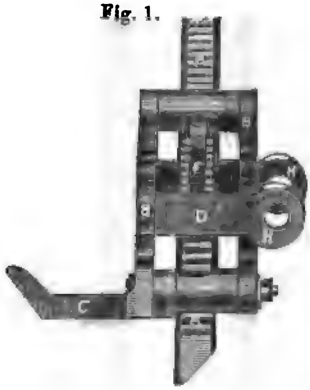
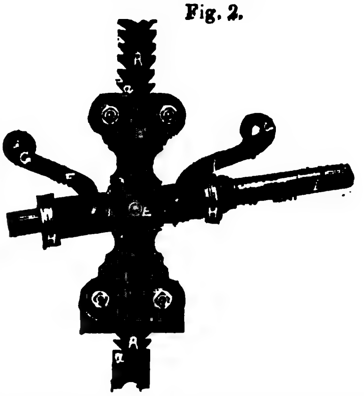


Fig. 2.



2 a side view of the apparatus. A is a vertical iron bar, provided with broad ratchet-teeth, *a, a*, on opposite sides, which teeth have their horizontal faces uppermost. Over this bar, A, which is grooved at its edges, slides a frame, B, which carries at its lower end a shoe, C, for inserting below the log to be lifted, and forming a rest or support for it. Jointed to this frame, at about the middle of its length, is a rocking-frame, D, which rocks on stud-pins, E, and embraces the vertical bar, A. This frame, D, carries two clicks or catches, F, F, which take respectively into the ratchet-teeth on the opposite sides of the vertical bar, A, and are held in contact with that bar by means of their weighted arms, G, G. The rocking-frame, D, is provided at one side with lugs,

H, to receive the end of a crow-bar or lever, I, for the purpose of actuating the rocking-frame. As this frame is rocked, the clicks, F, will be alternately lifted, the one rising to the next tooth in the rack with which it is in contact, while the other forms a fulcrum for the upward movement of the frame. By this means the frame, B, will be caused to slide up the bar, A, and two jacks of this construction being applied to opposite ends of the log to be raised, and operated simultaneously, the log which bears upon the shoes or supports, C, of the sliding frames of the jacks will be readily lifted. When the log has been raised to the required height, it is slidden off its supports, C, on to the pile of timber, and the sliding-frame of each jack is then lowered to take up another log. The lowering of the sliding-frame is effected by pressing the weighted ends of the clicks inwards, whereby the clicks will be disengaged from the ratchet-teeth, and the frame will slide down by its own weight.

HANCOCK'S VULCANIZED INDIA-RUBBER PATENT:—LAW CASE.

COURT OF CHANCERY, LINCOLN'S INN, JUNE 2.

The Queen v. Hancock and Others. Before the Lord Chancellor.

THIS was a petition on the common law side of the court, by the defendants, seeking either to quash, supersede, or recall a writ of *scire facias* which had issued against the petitioners. The writ had been obtained by parties for the purpose of annulling letters patent, granted some twelve years ago to the defendants, for an invention respecting the manufacture of caoutchouc, or vulcanized india-rubber; and the proceedings under it were very similar to an ordinary action at law, except that the Attorney-General's name was used as prosecutor. The only questions raised by the petition for the consideration of this Court were—1, as to the form of the writ; and 2, whether the Lord Chancellor should determine the issue raised by the writ, or, under the Common Law Procedure Amendment Act, send it to be tried at common law.

Mr. Webster, Mr. Karslake (both of the common law bar), and Mr. E. K. Karslake, for the petitioners, the patentees, urged that the writ was informal, inasmuch as it introduced into the record suggestions in the nature of evidence, which was wrong in itself, and raised an immaterial issue. His Lordship was not prevented from exercising his jurisdiction by the Common Law Procedure Act.

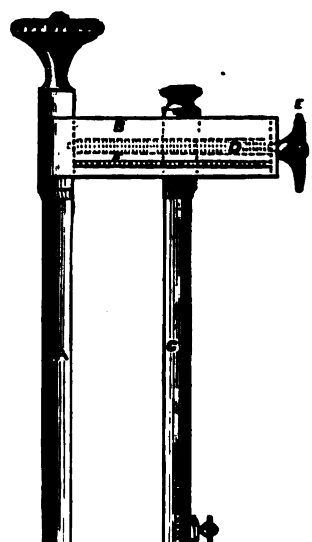
Mr. Rolt, with whom were Mr. Hindmarch and Mr. Macrory, of the common law bar, on the other side contended that, although the writ was analagous to a declaration at law, it had not violated any of the rules of pleading, and that the proper step for the defendants to have taken was a special demurrer.

The Lord Chancellor declined to interfere, as he was of opinion that the 39th section of the Common Law Procedure Act was intended expressly to reach such cases as the present, and, therefore, the proper course for the petitioners was to try the question at common law. His Lordship at the same time said that he would express no opinion as to the propriety of the form in which the writ had been framed.

BRIGHT'S REGISTERED PARALLEL COMPASSES.

(Registered June 1, 1855.)

THE accompanying engraving represents a side view of a parallel compass, capable of easy and accurate adjustment, and not liable



to slip or shift while being used, which has just been registered by Mr. C. T. Bright, of Liverpool. A is the stationary leg, which carries at right angles to it the beam or bar, B, which is slotted out vertically and longitudinally for the reception of the movable

leg, C. This leg is free to be shifted along the bar, B, by means of the screw, D, which is tapped through the upper part of the leg, C, and is turned by the thumb-screw, E, so as to cause the leg to travel along the bar. Upon the side of the bar is engraved a scale, F, by which the extent of the traverse of the movable leg, C, can be regulated, and measurements made.

SUBSTITUTE FOR RAGS IN PAPER-MAKING.

We have abstained from all mention of this process, for which a patent was granted to Messrs. Charles Watt and Hugh Burgess in August, 1853, until the experiments made with the view of testing its merits, and bringing it to absolute perfection, had arrived at such a point as would enable us to say that the process had succeeded completely.

These experiments have been performed on a very extensive scale in the United States and in this country, and the result is that pulp for paper can be produced, of first rate quality, at a cost which will cause it to become a most economical substitute for rags.

The paper difficulty may now be regarded as at an end, since the supply of wood is constant, and so large as to render it certain that no deficiency in the supply of the material for paper can again arise.

The process consists in first boiling the wood in caustic soda ley, in order to remove the resinous matter, and then washing to remove the alkali; the wood is next treated with chlorine gas, or an oxygenous compound of chlorine in a suitable apparatus, and washed to free it from the hydrochloric acid formed; it is now treated with a small quantity of caustic soda, which converts it instantly into pulp, which has only to be washed and bleached, when it will merely require to be beaten for an hour or an hour and a half in the ordinary beating-engine, and made into paper.

This process occupies only a few hours; in fact, a piece of wood may be converted into paper and printed upon within 24 hours.

In a few days from the period at which we are writing, this process will be exhibited in operation at the temporary manufactory, in the presence of a great number of persons interested in the supply of a material for paper. After this, steps will be taken to carry out the process on a large scale, by the formation of a company. Such of our readers as may desire further information may obtain it by applying to us.—*The Chemist.*

[We are not informed in the foregoing article, nor in the specification of the patent of Messrs. Watt and Burgess, what arrangement of apparatus they propose to adopt for reducing the wood to pulp.]

Exercises in Arithmetic for the Use of Schools, Artizans, and others who have to pass an Examination, either for Promotion or to obtain a Situation. By Robert Rawson, Head Master of the Dockyard School, Portsmouth, Honorary Member of the Manchester Literary and Philosophical Society. London: Whittaker and Co., Ave Maria-lane. 1855.

Answers to the above Exercises.

We entirely concur with Mr. Rawson in believing that teachers and students stand in need of a series of original, well-selected, and well-arranged questions illustrative of the rules of arithmetic; and we are not disposed to find fault with that gentleman for aiming, as he does in the work before us, to supply them with what they require.

"The questions," says the author in his preface, "consisting of nearly three thousand, are entirely new, and are arranged in convenient sections, with a view to facilitate the labour of the teacher as well as the student, who will be able to accomplish, at least, one section for every lesson. Instead of giving an appendix of miscellaneous questions at the end of the book, in imitation of several useful works on arithmetic, I have adopted a different plan, which I conceive is attended with considerable advantage, and from which I have derived great assistance in my own experience. The plan to which I refer is this; the examples are arranged in sections, and each section contains a question from each rule, forming something like an examination paper for candidates either for new situations or promotion."

We do not think he has adhered in the composition of his work to the plan here laid down; if he has we are unable to discover what is meant by the words "the examples are arranged in sections, and each section contains a question from each rule." But we observe, with pleasure, that Mr. Rawson has departed in a great measure from the old stereotyped questions to be found in almost all previous school arithmetics, and introduced others of a new class, which afford much better tests of the knowledge of a student.

Of course one of the principal requirements in works like these, is that the answers given shall be accurate, otherwise the pupil necessarily becomes perplexed and hindered. We do not feel called upon, of course, to work out three thousand problems before noticing such a production; but it is

desirable that we should examine a few instances. We have done so, and regret to find that errors do exist in the book, arising chiefly from want of efficient correction in passing through the press. For example, we turned to page 113, where several solutions are worked at full length. In the first the cancelling is incomplete, and a sign of addition supplies the place of a sign of multiplication. In the third (page 114) a 7 is left standing, which should have been cancelled, and the denominators of two of the fractions are placed against the signs of multiplication. These little matters, though very unimportant to a practised arithmetician, will prove confounding to tyros, and as it happens, the examples in which they occur are particularly intended for "aspiring artisans" who instruct themselves.

Mr. Rawson has injudiciously, we think, written a long and rambling preface to this little treatise, launching forth into the subject of education, foretelling that "many of the sons of workmen will have induced, by a liberal education in youth, the seeds of a power which can only fructify, bloom, and ripen into fruit by means of a higher and more extended study in the fields of pure and mixed science." In order that any "power," the seeds of which any sons of workmen may have "induced," may be helped to "fructify, bloom, and ripen into fruit," the author submits a few remarks with respect to the subjects of study, and books to be obtained. These remarks, if they were appropriate, would be worth but little, inasmuch as the author, instead of mentioning one, or two, suitable books on each branch of science, which might have been of some service to students unassisted by teachers, enumerates nearly the whole of the popular works published on each class of subjects. The presence of the preface will, however, be a hindrance to no one, and the work itself has merits which induce us to recommend it as a valuable aid to students of arithmetic; especially to such as are without the aid of a teacher.

Coal Mining Investigated in its Principles, and Applied to an Improved System of Working and Ventilating Coal Mines. By JOSEPH MARLOR, Sen., Oldham. London: C. A. Bartlett, Paternoster-row. 1854.

THIS work appears to be the production of a practical man, whose acquaintance with the subject upon which he writes has extended over a number of years. It is written with much candour, and contains many suggestions which deserve the attention of coal masters and others connected with the operations of mining for coals.

The principal feature of the book consists in its advocacy of a patent ventilating system which the author has introduced, and which possesses considerable merit.

"The improvement consists in fixing within the shaft, and extending from the top to the bottom of the mine, a tube or tubes, constructed of wood or cast-iron, made air-tight at the sides: the tubes may be either square or circular. Within these tubes, cages are employed, to contain the wagons and men. In the top or crown of the cage are placed two or more valves opening inwards, and at the edges or sides of the top are placed two or more lateral valves, so fixed that they may be pressed outwards and against the inner sides of the tube by the pressure of the air contained in it during the descent of the cage; the two valves at the top being pressed upwards and closed by similar pressure. When the cage is ascending, the valves at the top withdraw themselves from the sides of the tube; all friction between the cage and the sides of the tube being removed during the ascent. At the bottom of the tube is a door moving in grooves, opening upwards, by which the communication between the tube and the mine is carried on; this door being closed during the ascent and descent of the cage. Above or near this door is fixed an injection valve, to supply the tube with air at the time of ascending or winding up, should it be required; and near the bottom of the tube also is placed an injection valve, by which the air contained in the tubes is driven into the mines by means of the descent of the cage. Connected with this valve, and fixed between it and the inside of the tube, is fixed a safety valve (opened and shut by a rod or other suitable means communicating with the top of the shaft), which is shut while the men are ascending or descending, thereby preventing the air in the tube from escaping; and in the event of the rope breaking, when the cage should be descending, at a high velocity, there would be no falling with violence, if this valve were shut.

"The air expelled from the tube, at each descent of the cage, will be in addition to the ordinary ventilation, which will be going on at all times as usual." (Page 160.)

"There may, and doubtless will be, an objection to this plan," says the inventor, "on the ground of the expense; but even admitting this, what is the value of such an objection compared with the loss of life and property, in the event of an explosion?

"However anxious I feel on the subject, yet I do not anticipate its being adopted

except in new concerns, where I earnestly plead for a dispassionate consideration of the subject, before deciding against it.

"I feel, besides, that the fact of bringing out this plan without any other recommendation than its own merits, may be against it. I am willing, however, to take the risk of this, in the assurance that there are some spirited and enterprising individuals in the trade, who will look at it apart from the prejudice of great names, wealth, or influence. It will be a solace to me, if my fellow-creatures are thereby spared any amount of suffering or distress."

Mr. Marlor furnishes his testimony in confirmation of the necessity which exists for enlarged effort in placing education within the reach of a class which, perhaps more than any other body of British workmen, was, till recently, unvisited by the improving influences of culture, and pleads the cause of the miner with much earnestness.

"I can, from my own experience," says he, "assure the youths and young men who may read these remarks, that there was no information and advice such as I have here given, when I was young. The rule then was, with the generality of colliers, especially the young men, to work like slaves for four or five days in the latter part of the week, and when they had received their wages on the Saturday night, the alehouse was the place of meeting to divide the wages, where many got drunk, and continued in this state on the Sunday; and probably on Tuesday or Wednesday in the following week they would be found creeping again to their work. The beginning of the week having thus been lost, the week's work must be made up by extra working and long hours; everything must give way to them—on they must go; and if the least stoppage to their progress was occasioned by anything, whether it could be prevented or not, oaths and curses were heaped upon everything and everybody; and when Saturday night returned, the same round of drunkenness, swearing, and perhaps fighting, began as before. This is a true statement of what a collier's life was, with the great majority of them, thirty or forty years ago; and I fear it is the same even now with many, although perhaps not to the same extent as formerly.

"If, however, the boys and young men who are to be the future miners of the country, were educated as I have ventured to suggest, I have no doubt but that in a few years this gloomy picture of the condition of coal miners would be reversed, and call for a very different statement indeed, one which it would be pleasing to describe and gratifying to know,—that general intelligence and common civility had begun to form the true character of the British coal miner; and this, I must cherish the hope, will ultimately be the case."

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Kirkup, Lancelot, of Orchard-street, Newcastle-on-Tyne, mechanical-engineer. *Improvements in anvils.* Patent dated November 14, 1854. (No. 2408.)

Claim.—The system or mode of forming anvils by forging them in one entire piece without any welding, and afterwards case-hardening the same.

Pearson, Samuel, of Woolwich, Kent, engine-smith. *An improvement in the manufacture of gun-barrels, pipes, and tubes.* Patent dated November 14, 1854. (No. 2412.)

This improvement consists in forming barrels and pipes of two V-shaped strips of metal which are wound spirally round a centre, the base of the V in one strip being placed nearest the centre, while the apex or narrow part of the upper V-shaped piece is placed downward or nearest the centre, whereby the spaces between the first strip will be filled up, and the whole be ready for being rolled and welded.

Meeus, Pierre Joseph, of Paris, France, engineer. *A new or improved wind instrument.* (A communication.) Patent dated November 14, 1854. (No. 2413.)

The patentee describes an instrument the principal feature of which consists in the employment of two reservoirs of compressed air in such manner that by controlling the flow from these reservoirs the performer is enabled to effect peculiar variations in the strength and fulness of the tones produced.

Bodley, George, of Everhard-street East, London. *Improvements in revolving cannon.* Patent dated November 14, 1854. (No. 2414.)

In the arrangement described by the inventor, there is a fixed vertical axis on which several combined short barrels move, and a fixed barrel mounted on a suitable carriage. The combined short barrels have fixed on them a toothed wheel, which is put in motion by a pinion, so as readily to bring the short barrels successively into position to be discharged through the fixed barrel, and the series of short barrels is locked in position by a clog or bolt when one is about to be fired.

Chevron, Jean Marie, of Paris, France, civil engineer, and Charles Victor Frederic de Roulet, of the same place, late

a ship-owner, but now out of business. *Improvements in machinery for manufacturing textile fabrics.* Patent dated November 14, 1854. (No. 2415.)

This invention consists of a combination of machinery or apparatus for weaving a cloth or fabric made with two or more warps (one of which is called the fixed or foundation warp, and the other or others the floating warp or warps) the floating warp threads being used to form an external facing to one side of the fabric, covering the foundation warp threads more or less as the fabric may be more or less closely woven.

DAVIES, DAVID, of Wigmore-street, Cavendish-square, Middlesex, coach-maker. *An improvement in roller-blinds.* Patent dated November 15, 1854. (No. 2416.)

This improvement consists in making roller-blinds curvilinear in form, so as to be applicable to the circular windows of houses, carriages, &c.

BROOMAN, RICHARD ARCHIBALD, of 166, Fleet-street, London, patent agent. *Improvements in the manufacture of thread from gutta percha, and similar gums, in gilding, silvering, and ornamenting the same before and after being manufactured into fabrics, and in machinery and apparatus employed therein.* (A communication.) Patent dated November 15, 1854. (No. 2418.)

This invention consists in forming strands or threads of gutta percha, caoutchouc, and other similar gums either around a thread of silk, cotton, or other material, or not. One method adopted consists in surrounding a long thread with a shorter strip of gutta percha cut from a thin sheet, and, after raising the strip to a suitable temperature, spreading it out along the thread either by hand or with a draw-plate. Another method consists in placing a reel of thread in a close box containing gutta percha of a suitable temperature and drawing the thread out of an aperture, a coating of gutta percha being forced out with it by means of pneumatic or hydraulic pressure. A third method consists in employing an apparatus described, for the same purpose. Either of these methods may be modified for making threads of gutta percha alone, the linen or other internal threads being omitted. The inventor also prepares threads suitable for the manufacture of a waterproof or semi-waterproof cloth by laying down upon a table a series of rows of threads and coating them with caoutchouc or gutta percha, in the same manner as if a fabric were being coated. He allows the threads to dry, and when dry separates them, and winds them upon suitable reels or bobbins. These threads being used in weaving for the warp, and ordinary unprepared threads for the weft, or *vice-versâ*, a semi-waterproof fabric will be formed particularly adapted for garments, as it will to a great extent keep out wet, yet allow of the passage of perspiration from the body. To make drawn threads of gutta percha without core, the inventor makes use of a metal box traversed by tubes similar to a tubular boiler, and this box is heated by water, air, or steam. Rods or pieces of gutta percha are passed through the tubes in the box and are received upon a cylinder which is made to dip into cold water, from which the threads are wound upon another cylinder which, being of larger diameter, or revolving at greater speed, draws out the thread to the fineness required. In order to obtain fine strips of gutta percha, in addition to such as may be produced by other means, thin sheets of gutta percha are rolled upon a cylinder, which is withdrawn when the roll is sufficiently large, and strips are sliced off the roll by scissors, knives, or rotary cutters. In order to gild or silver the threads or fabrics of gutta percha, instead of employing small sheets of gold or silver leaf, the inventor causes gold or silver leaf to be wound with sheets of paper as usual between each layer into a roll of any desired length; and for the purpose of gilding or silvering gutta percha after being softened by heat, it is first formed into a roll and both the gutta percha roll and the gold or silver leaf roll are simultaneously unrolled against each other.

BRAMWELL, FREDERICK JOSEPH, of New Bridge-street, Blackfriars. *Improvements in steam engines and steam hammers.* Patent dated November 15, 1854. (No. 2420.)

A full description of this invention will be given hereafter.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *An improved mode of manufacturing soluble silicates.* (A communication.) Patent dated November 15, 1854. (No. 2421.)

Claim.—The employment of powdered slag from furnaces and felspar, and exposing the same in heaps with lime, and soda, and water for a sufficient time to effect the formation of the soluble silicates.

BUCHANAN, JAMES, of Glasgow, Lanark, gentleman. *Improvements in the manufacture of heddles or healds for weaving.* Patent dated November 15, 1854. (No. 2423.)

This invention relates to certain machinery for making a new or improved description of heddles or healds patented by J. Berrie and D. Anderson, and consists of various modifications whereby the original machinery is rendered more fully available for the manufacture of heddles or healds, and of other improved details wholly new.

INGALL, GEORGE HENRY, of Throgmorton-street, London, gentleman. *An improved*

method of communication between passengers and guards, &c., for the prevention of loss of life and accidents on railways. Patent dated November 16, 1854. (No. 2424.)

The inventor claims a described system of visible signals that are used in conjunction with whistles sounded by compressed air.

KNOWLES, PETER, of Bolton-le-Moors, Lancaster, foreman, and EDWARD KIRBY, of the same place, traveller. *Improvements in machinery for opening, cleaning, and preparing cotton, and other fibrous materials.* Patent dated November 16, 1854. (No. 2425.)

Claims.—1. The application of toothed plates to the arms of Hardacre's patent beaters.—2. Constructing the blades of the arms of Hardacre's patent beaters with two working edges.—3. The application of revolving or stationary combs or brushes to the draw boxes of carding engines.—4. The application of revolving or stationary combs or brushes, to the drawing rollers of drawing frames or other machines used in preparing cotton and other fibrous materials.

WILSON, ROBERT, of Birmingham, Warwick, manufacturer. *A new or improved ornamental material or fabric.* Patent dated November 16, 1854. (No. 2426.)

Claim.—"A new or improved ornamental fabric produced by ruling tartan plaid or chequered designs upon leather, woven and felted fabrics, parchment and vellum."

HENTON, SAMUEL, saddler, Lambeth, Surrey. *An improved saddle.* Patent dated November 16, 1854. (No. 2429.)

This invention consists in forming an elastic foundation or saddle-tree of leather or other suitable elastic material, and fitting the same with steel springs, and in using the said elastic foundation in place of the common wood saddle-tree now in general use.

PLATT, JOHN, of Oldham, Lancaster, mechanical engineer. *Improvements in machinery or apparatus for making bricks.* Patent dated November 16, 1854. (No. 2431.)

This invention relates to the machines patented by Mr. McHenry, July 20, 1852, and others in which a roller presses the material into moulds, from which it is expelled by pistons, and consists—1. In the application to the moulds of loose bottoms capable of being raised and pushed off with the pressed bricks, such loose parts being flat for producing solid bricks, and provided with projections for forming hollow ditto. 2. In constructing the pistons forming the bottoms of the moulds with projecting parts which form hollows extending to the outside of the bricks, at one or at both ends. 3. Certain modes of supporting a fixed cone, and constructing pistons to surround it.

HANN, WILLIAM, of Hetton Fence Houses, Durham. *Improvements in propelling vessels.* Patent dated November 16, 1854. (No. 2432.)

The inventor proposes to drive screw-propellers by means of the wind acting upon vanes placed upon a vertical shaft which is geared to the shaft of the propeller.

LOW, WILLIAM, of Lloft Wen, near Wrexham, Denbigh. *Improvements in ventilating mines.* Patent dated November 16 1854. (No. 2433.)

This invention consists in imparting the requisite heat to the air in a shaft of a mine "by the employment of steam in pipes or other forms of apparatus capable of effecting extensive heating surfaces to the passing air, and it is preferred that the steam boiler used for supplying the steam should be the ordinary one which works the steam engine."

WILSON, JOSEPH, of Hopton, York, manufacturer. *Improvements in the manufacture of printed warp fabrics.* Patent dated November 17, 1854. (No. 2435.)

Claims.—1. A mode of working in the loom printed surface warps for the manufacture or production of pile or loop fabrics, as described. 2. A mode of producing figured loop or pile fabrics, wherein the printed surface warp thereof is in two or more divisions, actuated separately and in succession. 3. A mode of working printed surface warps into loop or pile fabrics, wherein the printed warp is drawn or entered through two or more heddles worked in succession. 4. The manufacture of figured loop or pile fabrics from printed surface warps separated and actuated as described. 5. A mode of manufacturing figured loop or pile fabrics, wherein printed surface warps are divided and alternated through two or more heddles so as to give each heddle, and the section of printed surface warp passed through that heddle, a separate and independent action.

HIGGINS, JAMES, of Salford, Lancaster machine-maker, and THOMAS SCHOFIELD WHITWORTH, of the same place, manager. *Improvements in apparatus for moulding, for casting shot, shells, and other articles.* Patent dated November 17, 1854. (No. 2437.)

Claims.—1. The use of circular mould-boxes provided with similarly-formed recesses and projections on their peripheries, the two fitting into each other. 2. The employment of a plate or diaphragm carrying the pattern in combination with a circular box or boxes capable of being adapted to it by means of recesses or projections coinciding with the periphery or peripheries of the box or boxes.

MACADAM, JOHN, of Glasgow, Lanark, doctor of medicine. *Improvements in the*

preparation or sizeing of paper, or the materials used in the manufacture thereof. Patent dated November 17, 1854. (No. 2440.)

These improvements are applicable to the manufacture of such kinds of paper as are partially or totally "rosin-sized" and "machine-made," and they consist in the partial or total substitution of aqueous solutions of the uncombined acids, or of aqueous solutions of single sulphates, or of other binary compounds, for the alum usually employed.

Asprey, Charles, of New Bond-street, Middlesex, dressing-case, dispatch-box, and writing-case manufacturer. *Improvements in handles, particularly applicable to dressing-cases, dispatch-boxes, writing-cases, and other similar articles.* Patent dated November 17, 1854. (No. 2441.)

Claim.—Forming handles of two parts or flaps, one opposite to the other, which, when not required for use are folded down into hollows or channels made for their reception and lie flush with the part to which they are fitted; also, the adaptation to the flaps of springs which, on being liberated, cause them to fly up side by side, and offer a large and comfortable hold for the hand.

Bousfield, George Tomlinson, of Sussex-place, Loughborough-road, Brixton. *Improvements in preventing incrustation in steam boilers.* (A communication.) Patent dated November 17, 1854. (No. 2442.)

Claims.—1. "Separating impurities from water previous to the same being passed into a boiler by the use of the required degree of heat causing the impurities in said water to deposit on stones, twigs, or any suitable material with which said water is brought in contact." 2. "The use of horsedung (ammonia), charcoal, or other suitable substance, which, combining with the soluble substances in the water, renders them insoluble, so that they will deposit previous to being passed to the boiler." 3. Certain apparatus for carrying the foregoing arrangements into effect.

Ramsbotham, Henry Robert, of Bradford, York, worsted-spinner, and William Brown, of the same place, mechanic. *Improvements in combing wool, cotton, tow, certain descriptions of hair, and other fibrous substances.* Patent dated November 18, 1854. (No. 2446.)

The inventor claims the use of apparatus in which the fibres are fed on to the teeth of the receiving comb through screw gill combs, the teeth of which joint in a direction transverse or oblique to that of the receiving comb.

Belmer, Edouard, of Macclesfield-street, City-road, Middlesex, engineer. *A new manufacture of apparatus for warming rooms and workshops.* Patent dated November 18, 1854. (No. 2449.)

This invention consists in the use of one or more plates of suitable metal, made somewhat in the shape of a saucer, fastened together as described, and placed over an Argand or other gas burner.

Draper, Henry, of St. Michael's-terrace, Pimlico, gentleman. *The application of a new material to the manufacture of paper.* Patent dated November 20, 1854. (No. 2451.)

Claim.—The application of the cocoa-nut kernel to the manufacture of paper.

Keefe, Richard, of Nock-mills, near Trim, Ireland, miller. *Improvements in dressing flour.* Patent dated November 20, 1854. (No. 2452.)

The inventor employs a vibrating silk machine or sieve in which a finer silk is employed than has been used heretofore.

Dulaurens, Pierre Alexandre, and Marie Anatole Laubry, of Paris, France. *Certain improvements in glove fixings and fastenings.* Patent dated November 20, 1854. (No. 2453.)

Claim.—The method of fastening gloves by means of a metallic eyelet into which enters a metallic button.

Callan, Nicholas, of Maynooth College, Kildare, Ireland, professor. *Improvements in exciting agents in galvanic batteries, and in the construction of galvanic batteries.* Patent dated November 21, 1854. (No. 2455.)

This specification is given at length on page 538 of this number.

Knight, Richard, of Charterhouse-square. *Improvements in apparatus for testing iron as to its capacity for receiving magnetism, and in magnetic apparatus.* Patent dated November 21, 1854. (No. 2457.)

This invention consists—1. In constructing an apparatus for supporting bars of iron in the magnetic meridian in order to test their capacity for receiving magnetism. 2. In placing coils of wire on suitable frames, and then on the magnets, instead of coiling it round the piece of soft iron as heretofore. With this arrangement "the soft iron is alone revolved in the presence of the poles of the magnet."

Russell, Fisk, of Massachusetts, United States of America. *A new and useful machine for mowing grass.* Patent dated November 24, 1854. (No. 2458.)

This invention mainly consists in placing the axis of the secondary supporting-wheel of mowing machines at the side of and not in a line with that of the primary wheel, and in disposing the secondary wheel at the back or on the side of the driving shaft.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

HESKETH, ROBERT, of Wimpole-street, Middlesex, architect. *Improvements in apparatus for supplying fuel to grates, stoves, and fire-places.* Application dated November 11, 1854. (No. 2397.)

This invention is applicable to grates, stoves, and fire-places where the fuel is supplied upwards from a chamber, and consists in employing a flap or plate placed on an axis, and made capable of fitting and moving in a hollow chamber of a curved section raising up the fuel as it moves.

THOMSON, JAMES, of Dollar, Clackmannan, North Britain. *An improvement in obtaining motive power when fluids or liquids are used.* Application dated November 11, 1854. (No. 2398.)

The invention is applicable to Barker's mill and other similar instruments, and the inventor says, "I have discovered a peculiar law of fluids which is common to æriform and other fluids, by which the acting pressure of the fluid at the feeding end of the machinery may be that which is kept up at the source, and yet that the delivery end of the machinery shall only void the fluid at a comparatively slow rate consequent on its having to pass through a very extended pipe or passage between the feed end and the delivery end of the machinery;" and his invention consists in the practical application of the above discovery!

CADDICK, DAVID, of the Ebbw-vale Iron-works, Monmouth, mason. *Improvements in puddling furnaces.* Application dated November 13, 1854. (No. 2404.)

The improved furnaces are each constructed with a wrought iron plate on each back and front side, extending from top to bottom and from end to end of the furnace, and having suitable openings. The "tool boshes" have flues formed to them leading into upright flues formed in the angles of the chimney, by which the steam generated (by the hot tools being put into the water in the "tool boshes") passes away outside of the lining of the chimney, and thus tends to keep it cool. A flue is made at the back side of the furnace leading to the flues outside of the shaft, through which flue a rush of air passes and mixes with the steam from the "tool boshes," and this aids in keeping the parts cool.

LUSON, JOHN HEWLING, of Old Kent-road, Surrey, engineer. *Improvements in breaks for railways, and other like purposes.* Application dated November 14, 1854. (No. 2405.)

This invention consists in a peculiar hydrostatic arrangement which the inventor proposes to employ for actuating railway breaks and cranes, and for other like purposes.

HOWARTH, JAMES, of Poplar, Middlesex, steward. *An improvement in boots, shoes, and other coverings for the feet.* Application dated November 14, 1854. (No. 2407.)

This invention consists in the introduction of sheets or plates of any flexible metal, or metallic alloy, between the leathers of which the soles or bottoms of boots, shoes, &c., are made, the object being to arrest the passage of moisture from the exterior to the interior of them.

TURNBULL, ALEXANDER, of Manchester-square, Middlesex, doctor of medicine, at present in Boston, Massachusetts, United States of America. *An improved saw.* Application dated November 14, 1854. (No. 2409.)

The inventor so constructs the teeth of the improved saw that each tooth shall cut its way clean through the wood by acting as a mortising chisel, and standing in advance of the one next behind it.

LAW, HENRY, civil engineer, of Essex-street, Strand, Middlesex. *Improvements in guns, and in the projectiles to be fired therefrom.* Application dated November 14, 1854. (No. 2410.)

This invention comprises several features, but consists primarily in so enclosing and confining the gunpowder in a chamber, either formed within or attached to the body of the shot or other projectiles, as to insure the explosion of the whole of the powder, the chamber being of sufficient strength to detain the projectile within the gun until the elastic force of the vapour shall have reached any desired limit.

PARSONS, PERCEVAL MOSES, of Duke-street, Adelphi, Middlesex. *Improvements in projectiles.* Application dated November 14, 1854. (No. 2411.)

The inventor constructs projectiles in such manner that a rotatory motion on their axis is imparted to them by the escape of the gaseous products of a charge contained within them, or of a part of the gaseous products of the charge of the piece from which they are discharged, through suitably arranged passages and apertures in them.

WARNER, ARTHUR, of New Broad-street, London, merchant. *Improvements in combining sheets of copper or its alloys with lead, tin, zinc, nickel, gold, silver, platinum, or alloys containing these metals, or some of them, with or without the addition of copper, antimony, bismuth, arsenic, manganese, or mercury.* Application dated November 15, 1854. (No. 2417.)

This invention consists in combining sheets of copper or its alloys with sheets of the other metals mentioned by flushing or coating one surface of a sheet of copper or

its alloys with suitable solder, and then causing that surface to adhere to a sheet of one or other of the other metals mentioned, by means of heat applied through the copper sheet, aided by pressure.

MERIWETHER, WILLIAM HUNTER, of Coma, Texas, United States of America. *An improvement in the manufacture of rought-iron posts or uprights for fences and hurdles.* Application dated November 15, 1854. (No. 2419.)

Mr. Meriwether says, "This invention consists in rolling iron suitable for making hurdles or other iron fencing by causing the posts or uprights to be rolled with inclined sides in place of parallel sides, for which purpose I use rollers grooved."

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in air-pistols.* (A communication.) Application dated November 15, 1854. (No. 2422.)

This invention relates to ordinary air-pistols used as toys for children, and consists in so arranging their parts as to admit of their being discharged by one hand, and in constructing them with two barrels so as to discharge from both simultaneously.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in silk-winding machinery.* (A communication.) Application dated November 16, 1854. (No. 2427.)

These improvements consist in the winding of the silk staple from the cocoon on the reel in such manner that the successive coils only come in contact when the preceding ones have already dried, so as to prevent the silk staple from being stuck together by the glutinous matter developed by the heat of the bath in which the cocoons are immersed while they are wound off.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in obtaining alcohol, alcoholic, and acetous products.* (A communication.) Application dated November 16, 1854. (No. 2428.)

This invention consists in collecting the vapours arising from ovens during the baking of bread or other fermented farinaceous substances by means of a shield provided with a pipe communicating at one end with the inside of the oven, and at the other end with a condenser.

DAY, WILLIAM CHARLES, military equipage manufacturer, of the Strand, Middlesex. *An improved construction of portable camp-bed.* Application dated November 16, 1854. (No. 2430.)

The object of this invention is to provide a camp-bed which may be used without a bedstead, and not require to be packed in a valise to protect it from damp while being transported from one place to another, by applying to the underside of a mattrass a waterproof material, which is of sufficient size to cover the under surface of the mattrass and turn over to form a counterpane or quilt.

BELLAMY, JOHN, of Upper-street, Islington. *Improvements in graining and imitating marble, fancy, and other woods.* Application dated November 17, 1854. (No. 2436.)

The inventor stains the panel or other surface with a colour made to imitate the natural wood, laying it on with a sash-tool, and the lights or veins are taken out by passing over the surface a cylinder made to imitate the veining and natural appearance of the wood, as described in the specification of a patent of E. Barber, enrolled April 11, 1846.

CASTELAIN, LEON, of St. James's-place, Hampstead-road, Middlesex, chemist. *A new manufacture of pulp for making paper and millboard.* Application dated November 17, 1854. (No. 2438.)

This invention consists in reducing hay, straw, or similar fibrous materials into short pieces, and subjecting them to a solution of lime, soda, potass, pearlash, or chloride of sodium, at a suitable temperature, and also to sulphuric, muriatic, or hydrochloric acid. The fibrous material is then to be further reduced by apparatus suitable for cutting or pulping, and afterwards pressed and treated with chloride of lime and water.

KENNEDY, THOMAS, of Kilmarnock, Ayr, gun-manufacturer. *Improvements in shot or projectiles.* Application dated November 17, 1854. (No. 2439.)

In carrying out this invention with "cylindro-conoidal" shot, the cylindrical portion forming the after part of the projectile is made hollow, for the purpose of receiving a series of movable feather pieces which are arranged to be pressed through or into longitudinal slots in the cylindrical portion of the projectile by a piece of caoutchouc or other elastic material, also contained in the hollow of the projectile.

GAUNT, RICHARD, of Birmingham, Warwick, stamper and piercer. *A new or improved dress-fastening.* Application dated November 17, 1854. (No. 2445.)

This invention consists of a modification of the common fastening, in which the button or stud is passed through a slot in its seat, and then receives a half turn.

LUFF, HENRY JAMES, of Thanet-place, Temple-bar, Middlesex, engraver. *Improvements in the mode of attacking hostile bodies, also applicable to the obtainment of plans of forts, &c.* Application dated November 18, 1854. (No. 2447.)

The inventor proposes to employ balloons for bearing combustible and explosive mis-

siles over the works of an enemy, then disengaging them, and for taking photographs of an enemy's position.

Calard, Théodule François, machinist, of Paris, France. *Certain improvements in bedsteads.* Application dated November 18, 1854. (No. 2448.)

These improvements consist in surrounding or enclosing the space between the bed and tester-bed top or crown with perforated metallic sheets, wire gauze, or similar material, so as to form a kind of cage, by which the sleeper is protected from obnoxious influences, such as currents of air, stings of insects, &c.

Cumming, John, of Glasgow, Lanark, pattern designer. *Improvements in looms for weaving.* Application dated November 20, 1854. (No. 2450.)

This invention relates to a series of contrivances more particularly applicable for weaving in a circle, or continuously, by means of shuttles travelling round warps arranged in a circle, the same arrangements being capable of such modification as will render them suitable for weaving with a reciprocating shuttle, the line of traverse of the shuttle being either partially circular or rectilinear.

Adams, William Bridges, of Adam-street, Westminster, engineer. *Improvements in projectiles, projectile weapons, and their appurtenances.* Application dated November 20, 1854. (No. 2454.)

This invention consists—1. In constructing certain tapering projectiles to be fired from barrels with smooth bores, such projectiles being formed with either external or internal feathers which are to insure accuracy of flight, and a spiral motion if necessary, and being of lengths at least greater than their diameters, and in some cases as much as four, six, or more times as long. These projectiles are to be highly polished. 2. In constructing *papier maché* wads to be used with the projectiles before described. 3. In forming cannon of an internal cylinder of wrought metal covered with an outer cylinder of cast metal, the two being combined, as far as possible, by means of chemical fluxes. 4. In certain improvements in breech-loading guns. 5. In mounting guns upon the ball-and-socket principle. 6. In affixing iron shields to breech-loading guns in order to shelter the gunners. 7. In adapting caoutchouc springs to field artillery. 8. In forming the wheels of field artillery with elastic spokes. 9. In constructing practice targets made to run up and down hill, &c. 10. In making the ramrod of a musket serve as a bayonet.

Craig, Thomas, and Alfred Daniels, both of Manchester, Lancaster, warehousemen. *Improvements in the mode or method of communicating signals on railways.* Application dated November 21, 1854. (No 2456.)

The inventors propose to fix electro-magnetic apparatus on railway lines at any required distances so that any train passing will act upon the apparatus by means of a projecting bar.

PROVISIONAL PROTECTIONS.

Dated May 15, 1855.

1097. Robert Jobson, of Holly-hall Works, near Dudley, Stafford, ironfounder, and John Jobson, of Litchurch Works, near Derby, ironfounder. Improvements in the manufacture of moulds for casting metals.

1099. George Tomlinson Bousfield, of Sussex-place, Brixton, Surrey. Improvements in the manufacture of wrought nails. A communication.

Dated May 16, 1855.

1100. George Saxon, of Openshaw, near Manchester, engineer. Improvements in the construction of safety-plugs for steam boilers, and in valves for steam engines.

1102. Thomas Richardson, of Leeds, York, drysalter and manufacturing chemist. Improvements in dyeing cloth.

1103. Alphonse Réné Le Mire de Normandy, analytical chemist, of Judd-street, Brunswick-square, Middlesex. Certain improvements in converting fatty and oily substances into fatty and oily acids, and into soap.

1104. Edward Pellew Plenty and William Pain, of Newbury, Berkshire, agricultural-implement manufacturers and copartners. An improvement in ploughs.

1105. Charles William Siemens, of John-street, Adelphi, Middlesex, civil engineer. Improvements in cooling and in freezing water and other bodies.

1107. Robert Jamieson, of Ashton-under-Lyne, Lancaster, machinist. An improved machine, or improvements in machinery or apparatus, for forming or forging the burrs or nuts for screw-bolts; applicable also to forming, forging, or completing blanks for bolts and pieces of metal for other purposes.

1108. Robert Vezey and Edmund Vezey, of Bath, Somerset, coach-builders. Certain improvements in carriage-steps.

1109. John Henderson Porter, of Birmingham, Warwick, engineer. Improvements in coupling-blocks for trusses employed in roofs and other structures generally.

1111. Robert Murdoch, of Cran-hill, Glasgow, Lanark, surveyor. Improvements in agricultural apparatus for sowing seeds, and for depositing manure.

1112. Wharton Rye, of Miles Platting, near Manchester, Lancaster, ironfounder. An improved railway wheel, which may also be employed for other similar purposes.

Dated May 17, 1855.

1113. Thomas Dawson, of King's Arms-yard, London, engineer. Improvements in cases for containing pen, ink, and stamps.

1114. Alexandre Maximilien Mennet, merchant, of Paris, French Empire. Certain improvements in ornamenting textile and other fabrics.

1115. Jean Guillaume Butt and Jean Alfred Martin, of Paris, France. A new system of rotary steam engines.

1116. William Johnson, of Lincoln's-inn-fields, Middlesex, civil engineer. Improvements in the manufacture, treatment, and application of oily, resinous, and gummy substances, and soaps. A communication.

1117. Frederick Delacourt Blyth, of Birmingham, Warwick, manufacturer. Improvements in the manufacture of tea-trays, picture-frames, and other similar articles from papier-maché.

1118. James Rae, of Alpha-road, New-cross, Kent, engineer. Improvements in warming railway passenger carriages and compartments in steam vessels.

Dated May 18, 1855.

1120. Benoit Theodore Warée, of Paris, France. A new or improved apparatus for sharpening pencils.

1122. Julius Jeffreys, of Kingston, Surrey. Improvements in sun-blinds or solar screens.

1124. John Cumming, of Glasgow, Lanark, pattern-designer. Improvements in looms for weaving.

Dated May 21, 1855.

1126. Robert John Stainton and Edmund Charles Davey, of Holland-street, Blackfriars-road, Southwark, iron plate workers and stove manufacturers. Improvements in the construction of warming and other stoves for generating and radiating heat, and also for economizing combustion therein and attention thereto.

1128. Peter Boyd Eassie, of Gloucester, civil engineer. A sectorial or radial eliptograph.

1130. Benjamin Nicholls, of East-street, Old Kent-road, Surrey. Improvements in the manufacture and construction of buttons.

1132. Samuel Stocker, of Brighton, Sussex, engineer. Improvements in machinery and apparatus for shaping of metals, and also in such metal goods made from sheets, plates, or tubes, and also for other parts connected therewith, and for finishing the same when left by the machine or apparatus.

1134 Thomas Piggott, of Birmingham, Warwick, manufacturer. An improvement or improvements in telescopic gas-holders.

1136. William Joseph Curtis, of Hardinge-street, Islington, Middlesex, engineer. Improvements in aerostation or aeronautics and the mechanism connected therewith, which improvements may be rendered subservient to purposes of navigation.

1138. Louis Frédéric Isidore Ravenstin, merchant, and Charles Chatel, designer, of Paris, France. Improvements in the manufacture of blinds, screens, reflectors, and other articles of a similar nature.

1140. Antoine Fidelis Cossus, of Cagliari, Sardinia. Improvements in treating oils and fatty matters.

1142. Joseph Louis Rey and Adolphe Guibert, of Marseilles, France. A composition to preserve wood and iron, called a submarine and preserving coating.

1144. Alexander Henry Mentha, of Manchester, Lancaster, merchant. Certain improvements in the manufacture of wadding, and in the machinery or apparatus connected therewith.

1146. John Mahon Murton, of Somers-place West, St. Pancras, Middlesex, actuary. Improvements in sister-hooks and thimbles for ships' and boats' riggings, such improvements or parts thereof being applicable also to other purposes where hooks are required.

1148. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in signals for nautical purposes. A communication from Henry J. Rogers, of Baltimore, Maryland, United States of America.

1150. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Improvements in the construction of watches. A communication.

PATENTS APPLIED FOR WITH COMPLETE SPECIFICATIONS.

1174. Silas Safford Putnam, of Massachusetts, United States of America. A new or improved forging-machine. May 24, 1855.

1175. Samuel Edwin Robbins, of Vermont, United States of America. Certain new and useful improvements in fire-arms. Partly a communication from George Leonard, of the United States. May 24, 1855.

1177. Theodor Baron von Gilgenheimb, of Widenau, Silesia. A new machine for tilling land. May 24, 1855.

1214. Auguste Edouard Loradoux Bellford, of Essex-street, London. Certain improvements in ordnance, and in cartridges therefor. A communication from Charles Frederick Brown, of Warren, Rhode Island, United States of America. May 28, 1855.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June 5th,* 1855.)

183. Augustus Edward Schmersahl. Improvements in the manufacture of sulphuric acid, and in apparatus for effecting the same.

187. Barnett Samuel. Improvements in the manufacture of knife-handles, umbrella and stick-handles, door-knobs, articles of furniture, and other articles, having the appearance and transparency of solid tortoiseshell.

198. William Beales. Improvements in cartridges.

204. George Searby. Improvements in the manufacture of boots and shoes, also applicable to other articles made of or partly formed of leather.

240. John Francis Porter. Improvements in the manufacture of bricks, and other articles of clay or brick earth.

245. Alexander Prince. Improvements in fire-arms. A communication.

251. Jules Castel and Frederic Mauricheau Beaupré. A new system of burner for lamps called the pyropneumatic burner.

256. Robert James Maryon. Improvement or improvements in the construction of and manufacture of bullets, of shot, or projectiles.

265. John Henry Johnson. Improvements in the manufacture or construction of steam boilers or generators, and in the application of materials to such manufacture. A communication from Jackson, Brothers, Petin, Gaudet, and Company, of Rive de Gier, France, engineers.

267. Peter Armand Lecomte de Fontainemoreau. An improved mode of preserving railway and other tickets. A communication.

285. Peter Armand Lecomte de Fontainemoreau. An improvement in the mode of applying, as motive power, heated air combined with the vapour of ether or of any other liquid easily vaporized. A communication.

298. Adolphe Girard. Certain improvements in extinguishing fires.

303. Robert James Maryon. Improvement or improvements in the construction of and manufacture of ordnance, part or section of his said invention he applies for improvement in the construction of fire-arms of every class.

317. William Balk. Improvements in machinery for crushing grain and other substances.

355. Samuel Barlow Wright. Improvements in the manufacture of encaustic tiles.

376. Joshua Kidd. Improvements in machinery and apparatus for sewing and stitching cloth and other fabrics.
404. John Edmund Gardner. Improvements in portable cooking-apparatus and in cooking lamps.
424. William Armand Gilbee. An improved soap, to which he gives the name of "Saponitoline." A communication.
520. Henry Gilbert. Improvements in hurdles.
561. John Gracie. Improvements in wood-planing machines.
587. William Monday. Improvements in preparing, mixing, and grinding the various kinds of plumbago, graphite, or blacklead, either together or separate, and with or without other materials, for polishing, lubricating, and for other purposes, and in otherwise preparing the same for sale.
647. James Willis. Improvements in certain parts of the frames and furniture of umbrellas and parasols.
673. John Shaw, Lewis Harrop, and James Fielding. Improvements in machinery for spinning and doubling cotton and other fibrous materials.
748. Henry Richardson Fanshawe and John Americus Fanshawe. Certain improvements in the manufacture of waterproof fabrics of the vulcanized, sulphurized, or cured class.
795. Léopold Oudry and Alphonse Oudry. Certain improvements in preserving wood, metal, and other substances.
841. Philippe Amédée Devy. Improvements in the frames of swing looking-glasses. A communication.
877. John Charles Pearce. Improvements in making the joints of pipes and other articles.
1033. Alfred Vincent Newton. An improved construction of air-engine. A communication.
1044. Duncan Morrison. Improvements in the manufacture of metallic bedsteads, sofas, and other articles to sit or recline on.
1045. George Taylor. Improvements in steam-engine governors. A communication.
1060. Edward Humphries and Thomas Humphries. Improvements in machine-riddles for separating straw from grain, and for other similar purposes.
1072. William Bridges Adams. Improvements in the construction and propulsion of vessels for navigation, moved by internal power.
1074. George Whyatt. Certain improvements in machinery or apparatus for cutting piled goods or fabrics.
1079. François Alphonse Theroulde. Improvements in preserving animal substances. A communication.
1080. Thomas Rickett. Improvements in the construction of pressure-gauges.
1090. Alexander Robertson. Improvements in the construction of stoves and fire-grates.
1094. John Lackmann. An improvement in the manufacture of sheet iron. A communication.
1099. George Tomlinson Bousfield. Improvements in the manufacture of wrought nails. A communication.
1103. Alphonse René le Mire de Normandy. Certain improvements in converting fatty and oily substances into fatty and oily acids, and into soap.
1140. Antoine Fidelis Cossus. Improvements in treating oils and fatty matters.
1142. Joseph Louis Rey and Adolphe Guibert. A composition to preserve wood and iron, called a submarine and preserving coating.
1150. Alfred Vincent Newton. Improvements in the construction of watches. A communication.
1174. Silas Safford Putnam. A new or improved forging-machine.
1175. Samuel Edwin Robbins. Certain new and useful improvements in fire-arms. Partly a communication from George Leonard, of the United States.

WEEKLY LIST OF PATENTS.

Sealed June 1, 1855.

2579. George Aubury and William Richard Bridges.
2601. Charles Thompson Guthrie.
2696. Gustave Irenée Sculfort.
2697. Jabez Smith.

1855.

99. John Charles Pearce.
145. Samuel Isaacs.
468. John Coney.
620. Jonathan Musgrave.
722. William Edward Newton.

Sealed June 5, 1855.

2588. James Higgins.
2597. William Davis.
2608. Francis Puls.
2611. Richard Larkin.
2616. Charles Frederick Stansbury.
2629. John Court, Jun.
2632. Llewellyn William Evans and James McBryde.
2648. Peter Joel Livsey and William Weild.
2652. Matthew Curling Friend and William Browning.
2667. James Cunningham.
2673. John Avery.
2728. Thomas Boyle.

1855.

3. Joseph Seguin.
10. Claude Jules Fincken.
51. Edward Hayes.
114. James Lee Norton.
246. Isaac Jecks.
382. George Heppel.
396. Walter Neilson.
408. Victor Joseph Lebel, Jean Fourniol, and Jean Baptiste Remyon.
570. William Galloway and John Galloway.
590. Joseph Mitchell.
677. Charles Goodyear.
678. John Getty.
696. Marie Jeanne Thérèse Gillot and Cecile Celestine Beauvais.
760. Joseph Brazier.
802. George Fergusson Wilson, Conrad Abben Hanson, and James John Wallis.
804. George Fergusson Wilson and George Payne.
822. Thomas Hill.

The above Patents all bear date as of the day on which Provisional Protection was granted for the several inventions mentioned above.

NOTICES TO CORRESPONDENTS.

A Constant Reader.—We submitted your question to a gentleman well skilled in the art of electro-chemical deposition, and have received from him the following reply:—"I am inclined to think that electro-deposition, generally, is but slightly influenced by light. In some cases, however, its action becomes more manifest; as, for example, when solutions are prepared with hyposulphite of soda or the salts of iodine and bromine: these are readily affected by light, and consequently (the solution being thereby impaired) electro-deposition proceeds more slowly and less uniformly.

"In depositing silver from its solution, the *colour* of the deposit is much influenced by light—more especially when the solutions are prepared with any of the salts referred to: but the light appears to affect the colour of the deposit after it has been removed from the bath,—not while it is immersed in the liquid.

"I have always found that electro-deposition takes place fully as well at night or in a dark apartment as during the day-time, and from this I conclude that light does not favour electro-deposition."

J. B.—It is not yet published.

NOTICE TO SUBSCRIBERS.

As the sale of Back Numbers is attended with considerable trouble, the Proprietor of the *Mechanics' Magazine* finds it necessary to charge *double* price for all that have been published more than two years.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Mason and Co., *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

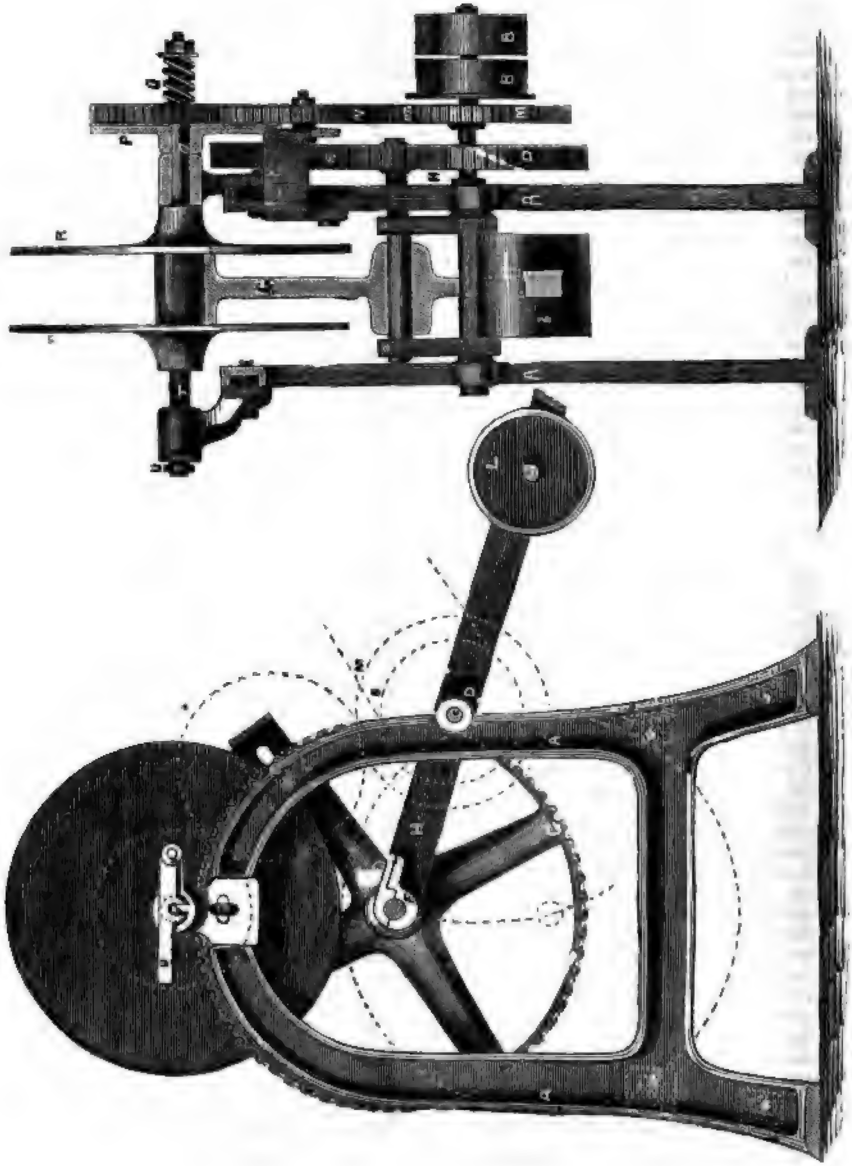
No. 1662.] SATURDAY, JUNE 16, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

FAIRBAIRN'S PATENT SLIVER-WINDING MACHINE.

Fig. 2.

Fig. 1.



FAIRBAIRN'S PATENT SLIVER-WINDING MACHINE.

THE engravings on the preceding page represent a machine patented August 28, 1854, by Mr. P. Fairbairn, of Leeds, the object of which is to wind slivers of fibrous materials into laps for the purpose of being placed behind the feed-rollers of succeeding machines. Fig. 1 is a side elevation, and fig. 2 an end elevation, partly in section. A, A is the framework of the machine; B, B are fast and loose belt-pulleys mounted upon the driving-shaft, C, which is carried in suitable bearings in the framework, A, A; D is a spur pinion keyed upon the driving-shaft, C, and taking into the spur-wheel, E, keyed upon the shaft, F, which also carries the winding-on drum, G. This shaft, F, is mounted in suitable bearings in the forked lever, H. The driving-shaft, C, also acts as a fulcrum for this lever. A preponderating weight, L, is fixed on the other end of the lever, H, to enable it to bear up the drum, G, in contact with the bobbin on which the fibrous material is to be lapped. M is a spur-wheel keyed to the driving-shaft, C, and taking into an intermediate wheel, *m*, which takes into another spur-wheel, N. This wheel, N, has one side truly turned so as to correspond with the friction-plate, P, which is keyed upon a shaft, O. Between the friction-plate and the spur-wheel, N, is a washer, made of leather, felt, or other suitable material; the spur-wheel, N, is loose upon the shaft, O, and pressed against the friction-plate, P, by means of a spiral spring, Q. R and *r* are two disc plates mounted upon their respective shafts, O and T, and provided with recesses into which the bobbin, S, is fitted. U is a pawl which drops into a groove in the shaft, T, and thereby holds the shaft in position; but when raised it permits of the plate, *r*, being drawn back for the purpose of putting in and taking out the bobbin, S.

It will be seen that when rotary motion is given to the driving-shaft, C, the train of spur-wheels, M, *m*, and N, will actuate the disc-plate, R and *r*, by means of the friction-plate, P, and thereby cause the bobbin to rotate in contact with the winding-on drum, G, but at a superior surface speed. Slivers of fibrous material being now supplied to the machine in the usual manner, they are wound upon the bobbin, S; and as the diameter of the lap increases, the drum, G, will be forced down, and the pressure of the drum upon the lap will, to a certain degree, overcome the power communicated to the friction-plate, P, and cause that plate to slip over the surface of the wheel, N, by which means the speed of rotation of the lap will be regulated, and the slivers will be tightly wound upon the bobbin.

ON PEAT AND SOME OF ITS USES.

WHILE it is a most important and satisfactory circumstance that the coal-mines of this country manifest no symptoms of exhaustion, notwithstanding the enormous demands continually made upon them by the varied and extensive fuel-consuming processes of this and other countries, it is nevertheless a pleasing fact that, in the deposits of peat with which many portions of the United Kingdom abound, we are furnished with a material from which may be obtained an excellent fuel, less costly, but not less abundant than coal itself. The attention of many scientific persons has recently been turned to these deposits, and the results of their investigations are now accessible to all.

"Peat is vegetable matter undergoing partial decomposition, and probably its formation commenced at a very remote period of the world's history. It is found in natural basins, formed by the inequalities of the earth's surface, wherein the water is dammed up and prevented from flowing into adjacent streams and rivers. In these lakes vegetable matter has accumulated, and is undergoing various changes, and final decomposition. In the earlier deposits it is characterized by a nearly homogeneous structure; but the later and more superficial deposits present a less decomposed and compacted character, and have the general appearance of an entangled and felted structure, composed of partially decomposed moss and grass, and not unfrequently shrubs and trees; the moss and grass have the appearance of gradual and successive decomposition at the roots, whilst they continue a vigorous vegetation at the surface.

"The entire mass, both of the more compact and the less solid peat, is composed chiefly of ligneous matter, and may be considered as analagous to woody fibre; its quality, however, is frequently affected by the special circumstances of locality. The best samples we have met with have contained, when dried, about 70 to 75 per cent. of carbon, but other samples were contaminated with earthy matters to the extent of 5 to 10 per cent. The average impurities may be taken at 4 to 5 per cent., and we have found some samples of peat charcoal yielding 94 per cent. of fuel."*

* Mr. W. Longmaid, in a lecture before the Society of Arts, January, 1855.

Overman, in his celebrated work, "On the Manufacture of Iron," gives an analysis of relative values of fuel, which he states to be of European origin, and as they have been mostly drawn up by Berthier, they may be relied upon as correct. From these tables we copy as under, in order to show the value of peat or turf fuel as a heating agent:

Oak, air-dried	31 per cent.
Beach, birch, and pine	31 „

VALUE OF CHARCOAL.

Poplar, maple ash, average	68 per cent.

Charcoal from other species differs but slightly.

VALUE OF TURF.

French specimen, 18 to 34, average	26 per cent.
German „ 26 to 42 „	34 „
Irish „ 28 to 62 „	45 „

VALUE OF TURF CHARCOAL.

French specimen, 40 to 58, average	49 per cent.
German	64 „
Irish	84 21-26ths.

VALUE OF STONE COAL.

Newcastle	70 per cent.
France, Grande Croix	67 „
Spain, Asturian	59 „
France, St. Etienne	57 „
Cherry coal, Derbyshire	61 „
Cannel coal, Glasgow	56 „
„ Lancashire	53 „
German	48 „
Austria	43 „

The following Table may also be relied upon:

Species of Fuel.	Pounds of Lead reduced by 1″ Fuel.	Pounds of Water which 1″ Fuel can heat from 32°-212°.	Pounds of Water which 1″ Fuel can evaporate from 212°.	Observers.
Oakwood	12·50	28·30	5·27	Berthier.
Fir	14·50	32·80	6·11	Wruker.
Pine	13·70	31·0	5·77	Berthier.
Peat from Lough Allen	27·7	62·7	11·5	Griffiths.
French Peat	12·3	27·9	5·2	Berthier.
Ditto	15·3	34·6	6·4	Ditto.
Welsh Coals	32·96	74·48	13·88	Phillips.
Scotch Coals	24·32	54·96	10·24	Ditto.
Newcastle	30·36	69·83	13·0	Ditto.
Lancashire	28·28	65·49	12·20	Ditto.

Among the various persons who have recently obtained advantageous results in the preparation of peat for the stove and furnace are Messrs. Gwynne and Co., of Essex Wharf, Strand, who have publicly offered to contract to put up the necessary machinery to make from one ton to fifty tons of solidified peat per hour, at a cost not exceeding a few of the gold-crushing machines, and who, indeed, offered to one of the members of the Government to convert the Dartmoor bog into an excellent fuel at the rate of fifty tons per hour, for use in the small stoves sent last winter to the troops in the Crimea. According to one of the patents of Messrs. Gwynne, "the peat, as dug from the bog, is thrown into a series of cages, placed in a large centrifugal machine, and deprived of so much of the moisture as to make it ready for the mill, where it is ground to a powder, passed thence through a series of cylinders, revolving in a heated chamber, when the remaining moisture is evaporated, and the powder heated to the proper degree for compression; from whence it is carried, from the last cylinder, by two pockets, to the compressing tables, which having passed through, the solidified peat is ready for use." According to another of their patents, "the peat, for its ordinary preparation for conversion into fuel, is taken as it is at present found, in the natural wet and spongy state; in that condition the blocks or portions, as they are cut from the

bog, are subjected to the action of a series of pressing rollers, and are by that operation relieved of a considerable quantity of the water they contain, and they are thus passed through successive sets of pressing rollers until the moisture is sufficiently pressed out of them, or the moisture may be removed by any other arrangement or process most convenient. The cakes or slabs of partially-dried peat thus produced are then passed between cylinders revolving in opposite directions, or one revolving and the other stationary, and having at equal distances along their outer surfaces projections about equal to the thickness of the slabs of peat; the result of this operation is, the reduction of the slabs or blocks into pieces of a convenient form or size for ordinary use, or for further preparatory treatment. Such portions of the peat are then subjected to any of the ordinary and known modes of desiccation, or it is from that state converted into charcoal, and is then ready for use or further treatment."

The *Mining Journal* gives the following account of the processes now adopted by Messrs. Gwynne and Co.:

"The rationale of the process of preparing turf, and rendering it a pure fuel, fit for the most delicate metallurgical operations, was, under the original patent, to air-dry the turf, by which it lost 40 per cent. of its hygrometric moisture; but the patentees have since still further simplified and economised the process, by which the peat can now be taken from the bog, instantly operated on in the drying cylinders, passed to the compressing machine, and turned out a perfected fuel of great specific gravity in the form of a brick, by one continuous and rapid process. As the foreign patents are not, however, yet matured, we cannot make public this part of the arrangement, and in describing the *modus operandi*, we must on this occasion take the turf as air-dried. By means of a chain of endless buckets, commonly called a 'Jacob's ladder,' it is raised and poured into a hopper, placed over a series of cylinders heated by steam, from which it emerges a perfectly dry impalpable powder. The heat being properly regulated, it enters the hopper of the compressing engine at a temperature of 180°, at which the tarry properties of the turf are just sufficiently developed to form a powerfully cementing compound, and the brick of compressed turf, when cold, is a dense and solid body, with a higher specific gravity than, and possessing all the good qualities of, coal, with none of its impurities or defects, and containing many useful properties, which the best mineral carbonaceous fuel does not possess.

"The compressing machine under notice forms a brick of one pound in weight; but, although such sizes will be found useful for many purposes, it is proposed in practice to employ a much more powerful apparatus, capable of compressing masses of 4 lbs. each, about the size of a common brick, and half its specific gravity. The fuel is perfectly homogeneous, withstands the abrasive and destructive operation of the blast better than coal or coke; and we believe that when properly appreciated and brought into use, not only for metallurgical but steam-engine, domestic, and numerous other purposes, it will be found the most effective and the most economic fuel yet known. To lead to a proper understanding of this subject, it must be borne in mind that *dry peat* is the great object sought; the large quantity of water held by it in its natural state, and its hygrometric character, or power of absorbing moisture from the atmosphere, have hitherto been the chief obstacles to successful results in its preparation. After apparently the most perfect air-drying, and feeling without moisture to the touch, peat as now prepared contains from one-fourth to one-third of its weight of water, greatly depreciating its calorific powers. By the processes patented by Messrs. Gwynne, this adulterating agent is entirely got rid of; and the really useful portion of the peat, with all its carbonaceous, bituminous, and saline properties, in a state fit for perfect combustion, is preserved intact."

Specimens of the patent solidified peat fuel of Messrs. Gwynne have been submitted to Dr. Letheby, who makes the following statements respecting it:

Its specific gravity is as high as 1·140, and its structure is exceeding hard and dense.

The actual stowage weight of one cubic foot of the material is 71·24lb. avoirdupois, that of Newcastle coal being about 49·69lb.

100 parts of the peat contain 9 of hygroscopic moisture; they yield 55 of volatile matter, much of which is condensible, and 36 of charcoal.

The charcoal contains 3·8 of ash.

The avoirdupois pound, or 7,000 grains of the peat were submitted to distillation in an iron retort, and the volatile products were conducted through a red-hot iron tube, in the hope that the paraffine, &c., of the tar would be decomposed and converted into a gaseous hydro-carbon of high illuminating power,—the results were 2,520 grains of charcoal, 1,320 of ammoniacal liquor, 360 of thick tar, and 2,800 of combustible gas, —the gas occupied the bulk of 6·25 cubic feet, and when burnt at the rate of five cubic feet an hour, from an argand burner with fifteen holes and a seven inch chimney, it gave a light equal to that of seven sperm candles, each burning at the rate of 120 grains per hour.

100 parts of the peat therefore furnish—

Porous charcoal	36·00
Ammoniacal liquor	18·86
Thick tar containing paraffine	5·14
Gas having an illuminating power of 7 candles	40·00
	100·00

He considers that these results are highly satisfactory, for they indicate that a large per centage of valuable products may be obtained from peat.

The amount of gas is very considerable (a ton of the material furnishing as much as 14,000 cubic feet of gas), and although the illuminating power is not very high, yet, from the fact that much of the tar and paraffine had actually been rendered gaseous by their passage through a red-hot tube, there is every prospect that they might be still further decomposed and converted into gases of high illuminating power. The gas, when purified by passing through an alkaline mixture was found to be entirely free from sulphur, and in this respect it has great advantages over coal gas, for the products of its combustion are wholly harmless in respect of their action on inorganic matter, such as books, drapery, and other perishable fabrics; in its use as fuel, there is no opaque smoke evolved, no sulphurous acid is set free, the heat is quickly raised and quickly diffused, and the ashes never clinker so as to choke the bars of the furnace, and the peat does not contain any metallic sulphuret or other substance that is likely to produce spontaneous combustion. In short, it fulfils most of the conditions which are mentioned by Dr. Lyon Playfair and Sir H. De La Beche in their report as to the requisites for a good fuel.

These statements, proceeding from Dr. Letheby, prove conclusively that we have now placed at our disposal means by which the extensive bogs with which Ireland in particular abounds, may be converted into fuel of a superior quality, possessing many peculiar and advantageous properties, especially when considered as a heating agent, for if Irish peat, containing from 25 to 33½ per cent. of water, gave such results as are stated above by Griffiths, the calorific value of Gwynne's patent solidified peat must be considerably greater than any fuel that we are acquainted with, as it appears that peat charcoal stands first in heating qualities, being superior to wood charcoal or coke.

One object to which Messrs. Gwynne and Co. apply their prepared peat is a new method of reducing ores. In carrying out this method, the peat fuel having been properly prepared and pulverized, is combined with other substances, as lime, manganese, &c., and in such quantities, as upon the usual estimates or testing experiments to determine with precision the proper working character of the furnace-charge it may be found expedient to adopt, and upon which they adjust and determine the character and quantities of these corrective materials best suited for a favourable result. All the necessary substances being pulverized and prepared, the patentees take of the ore itself the quantity intended to operate upon, and to which the materials have been adjusted, and reduce it also to a comminuted state. The ingredients are then thoroughly mixed, the moisture evaporated, and the mass formed by powerful compression into globular lumps of convenient size, which being piled up in the furnace, admit a sufficient quantity of air to play through the interstices, thus affording the necessary oxygen to the carbonaceous portion of the charge.

"These processes," says the *Mining Journal* in noticing the invention, "it will be seen, vary much from the present methods adopted in smelting metallic ores, are based on scientific principles, and evince much ingenuity. Instead of layer over layer of fuel, ore, and flux, the patentees intimately mix and consolidate the whole in blocks, and the fuel being free from all impurities, and the fluxes and correctives being intimately blended with the pulverized ore, the metal is at once reduced and run off in a pure state. In the manufacture of steel particularly, the various qualities of which depend on the proportion of carbon combined with the metal, the patentees are enabled to supply with unerring certainty any particular quality, known by experiment to contain a certain portion of carbon; and thus the engineer or workman may always depend on obtaining, if required, the same description as previously supplied for any particular manufacture. From the experiments already made, results can be produced in much less than half the time at present required; and it is expected eventually in practice it will not exceed one quarter, reducing the cost of the best steel to one-third of the present price, with a corresponding saving in time, and reduction in price, in all other metals."

As it will be interesting to our readers to have before them a statement of the peat resources of these kingdoms, we subjoin the following information given in a letter prepared by Messrs. Gwynne and Co.

In 1809, a parliamentary warrant was issued, appointing certain commissioners to inquire into the nature and extent of the several bogs in Ireland, and the possibility of draining and reclaiming them. The said commissioners made the required investigation, and communicated to the House of Commons the results of their several inquiries, together with the evidence on which the results were founded, in a series of four reports.

The first report was made on a district containing 36,430 English acres; the second report, on 233,538; the third, on 474,808; and the fourth, on 305,012 English acres, all of which had been minutely surveyed and levelled. These four reports included twenty-five local reports, containing the opinions of ten different engineers. In addition to 1,049,588 English acres surveyed by authority of the commission, there were 1,816,642 acres subjected only to their partial examination, making the total aggregate amount of bog lands in Ireland to be not less than 2,866,230 acres; but this amount does not contain all the bogs of Ireland—to our own knowledge, a gentleman of our acquaintance holds from 800 to 1000 acres of splendid mountain bog not noticed by the commissioners, and there may be thousands of acres elsewhere used as mountain pasture; we feel, therefore, justified in taking the aggregate amount at 3,000,000 acres of bog.

We next require to know the average depth of these bogs, and for this purpose we will make use of the report presented to the House of Commons, in 1851, by Sir Robert Kane, Director of the Museum of Irish Industry. A description is given in that report of 27 specimens of peat, taken from various bogs in Ireland, with the names of the localities from whence obtained, the average depth of bog, and number of acres; and we believe we are correct in stating that the average depth was 21½ feet, representing 236,590 acres—some of the bogs were 30 and 40 feet deep. From the report of the commissioners of 1809, we select 120,000 acres, with an average depth of 23 feet; and 178,000 acres, at an average depth of 13¼ feet: taking an average of the whole would give 19½ feet. A period of upwards of 40 years has elapsed since Mr. Griffith, one of the commissioners, furnished his appendix to the fourth report, wherein he states that he "had an opportunity of observing during 20 years the growth of a bog, which amounted to two inches per year." He informs us that "he was enabled clearly to observe this fact from a turf bank having been cut into the place where the lake formerly was; and from the variety in the colour and texture, he calculated the annual growth of the moss with nearly as much accuracy as the age of a Scotch fir tree may be determined, by observing the number of concentric rings when the stem is cut across."

In the course of the examination instituted by the commission, it was ascertained that by far the larger portion of these bogs had been unclaimed and uncultivated since the time of their formation; and now, after nearly half a century, they are still in the same state, but improving in depth and quality, if we are to credit Mr. Griffith's report.

From the 3,000,000 acres with an average depth of 19½ feet, let us, for the purpose of making solidified peat, take 2,000,000 acres with (say) an average depth of only 12½ feet: 100 square yards, 12½ feet deep = 180 cubic yards of air-dried peat, weighing about 72 tons. This is equal to 8718 cubic yards, or 3486 tons per English acre: 2,000,000 × 3486 = 6,972,000,000 tons of air dried peat.

As we find, however, that air-dried peat contains from 20 to 30 per cent. of moisture, which is to be got rid of before being solidified, we will deduct from the 6,972,000,000 tons (say) one-third, or 33⅓ per cent., for moisture. This will give us 2,324,000,000 tons of water, leaving us still 4,648,000,000 tons of solidified peat. By making use of the present wasteful means of manufacturing iron, we will allow 3 tons of solidified peat to 1 ton of bar-iron—that is, 2 tons for smelting the ore, and 1 ton for the refining, which would give us 1,549,333,333 tons of bar-iron—although we feel assured that 1½ ton of best solidified peat only would be necessary by our new patent process, which would increase the production of iron in an equal ratio; but, as we stated that we believed we could show that, for 500 years to come, this country would not require to draw her supplies of the finer quality of iron from either her colonies or foreign countries, we will take the 1,549,333,333 tons, and divide by 500 years; and we find the result to be 3,098,666 tons.

We have not been able to ascertain correctly the amount of acres of bog lands in England, Scotland, and Wales. It may amount to an equal quantity as Ireland; but, taking it at the one-half, have our ironmasters any cause to fear a want of fuel, and that of the very best description, for centuries to come?

ON THE ROOFING OR COVERING OF RESERVOIRS:

ACCIDENT AT THE RESERVOIRS OF THE SOUTH LAMBETH WATERWORKS.

A recent and very proper Act of Parliament has compelled water companies, in *and around* the metropolis, to cover in their reservoirs, so as to protect the water from the impurities with which the atmosphere of London becomes more or less impregnated.

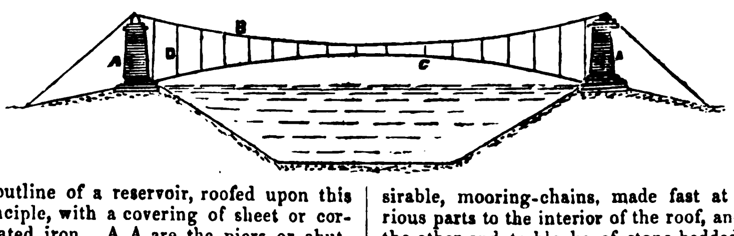
In conformity with this Act, the South Lambeth Company contracted for the covering in of their reservoirs at Brixton, four in number, which occupy an area of nearly four acres, and are 22 feet deep, 700 feet long, and 200 feet broad, the water being supplied from Thames Ditton. The species of covering erected was composed of a series of massive bricked arches, each about 30 feet wide, stretching across the entire width of the reservoir, and 20 feet in height, the surface of the arches being covered with a layer of clay 2 feet thick. Since the closing in of the first reservoir, gangs of labourers have been engaged, day and night, in completing the work below, striking the centres from the arches, and removing the scaffolding, stages, &c.

It is stated that a considerable number of the centres, on which the arches had been turned, had been removed, and no appearance of danger was observable, when, on a recent occasion, with scarcely any warning, twelve or fourteen of the arches gave way, and fell to the bottom of the reservoir with a loud crash, burying beneath them the unfortunate men who were at work below; several labourers who were engaged on the top falling with the mass. The shock occasioned by the fall alarmed the whole neighbourhood, and almost every person living in the vicinity repaired to the spot to render aid. Several of the men who fell in with the vaulting managed to extricate themselves without assistance. Others, however, were found in an upright position, hemmed in amongst the ruins, where they remained some time ere they conld be released. As may be supposed, prompt measures were taken to extricate the unfortunate creatures who were buried beneath the ponderous mass, but though nearly 200 labourers were engaged in the task, it was not until close upon eleven o'clock that the whole of the sufferers were got out. Four of them had been crushed to death. Seven others were found sadly injured.

The jury which sat upon the bodies of the deceased workmen returned a verdict to the effect that, the cause of the fall of the arches arose from the fact of the centres being removed before the wheeling and placing of the earth had been completed, and suggested that an increased thickness should in future be given to the brickwork.

We attach but little importance to this verdict. In our opinion, the massive and heavy roofing above described is not at all necessary for the effectual closing-in of water reservoirs. A much more appropriate system of roofing, for such purposes, is unquestionably that patented by Mr. J. Braithwaite, civil engineer, on the 10th of June, last year, which consists in constructing suspension roofs and coverings, in which all central or internal shafts or supports are dispensed with, the end piers or abutments being formed of a strength sufficient to sustain the weight of the whole.

The accompanying engraving represents



an outline of a reservoir, roofed upon this principle, with a covering of sheet or corrugated iron. A A are the piers or abutments, and B the chains, which are carried over saddles on the top of the piers, and the ends of which are built into masonry, or otherwise secured, so as to prevent any lateral strain on the piers. C is the roof or covering, suspended and supported from the chains, B, by rods or links, D D. E is the reservoir. If thought necessary or desirable, mooring-chains, made fast at various parts to the interior of the roof, and at the other end to blocks of stone bedded in the floor of the reservoir, or to other moorings, may be introduced, to prevent the action of the wind from lifting the roof.

The cost of a suspension roof, constructed as above described, would certainly be much less than that of the brick structures at Brixton, and would fully answer every purpose for which the latter were designed.

THE STANDARD OF MEASURE.

A remarkable and highly interesting inquiry has been conducted for the last few days before a select committee of the House of Lords, that has been sitting to consider the provisions of a bill which has already passed the Lower House, and is entitled "An Act for Legalizing and Preserving the restored Standards of Weights and Measures." The following excellent remarks upon the subject, which appeared in the

Times of Monday last, claim a place in our pages.

The inquiry related specifically to the standard of measure; but before explaining the exact question at issue it may be as well to recall the circumstances under which it has arisen. It will be remembered that the old standards were lost in the fire which destroyed the former Houses of Parliament, and that in consequence, so far back as the 11th May, 1838, a Royal Commission was appointed to consider the steps to be taken for their restoration. This commission consisted of a number of scientific men, including, among others, the Astronomer Royal. By them it was decided to adopt as a standard of measure a standard yard, the dimensions of which are determined by measuring with the aid of microscopes the distance between two points, indicated by lines traced on a bar of gun metal. Accordingly, the bill now before the House of Lords contains a minute description of this standard yard, which, in compliance with the recommendation of the Royal Commission, the Government proposes to legalize. It turns out, however, that while our philosophers and men of science were engaged in determining in their own way the most perfect means for securing accuracy of measurement, Mr. Whitworth, of Manchester, has, for practical objects of great importance to the nation at large, as well as to himself individually, been directing his attention to the same subject. He wanted a measuring machine as perfect as he could make it, in order to secure increased accuracy in his system of gauges and generally in the workmanship of those tools for the manufacture of which he enjoys so deserved a celebrity. In order that the importance of such a measuring machine may be fully appreciated, it may be well to refer to the illustration afforded by the Baltic fleet. The Admiralty, in the construction of their marine engines, have always wisely insisted upon the use of Whitworth's registered gauges; so that if a screw or plug or fastening of any kind gives way, a substitute of the same register, and therefore certain to fit, can at once be produced. Hence it follows that one not very large floating mechanic's shop is quite sufficient to meet all the emergencies of the service in the way of damaged machinery for the whole of that mighty steam armada now facing the batteries of Cronstadt. Such a result would be utterly unattainable but for that extraordinary nicety in determining sizes to which Mr. Whitworth has attained. It may be recollected that at the Exhibition of 1851 Mr. Whitworth showed a machine which measured to the millionth part of an inch, and which enabled any one to calculate the expansion caused in a bar of iron a yard long by touching it lightly for a moment with the finger tip. The same arrangement is now adopted by him for the production of standards of measure, the principle being that the standard is obtained by measuring the distance between the perfectly flat ends of a solid bar having true surfaces on its sides and ends. His test is that of the touch, and by it he can correct errors in dimensions up to the millionth of an inch, whereas the plan of the Royal Commissioners, depending on the sight, aided by the microscope, can only correct errors to the 60,000th of an inch. The most powerful microscope that has yet been made cannot enable the eye to distinguish more than 60,000 lineal divisions in an inch, and in order to reach this degree of accuracy, the object glass must be so near as greatly to interfere with the practical utility of the standard. But with end measurement an accuracy carried to a point twenty times as great can be combined with a perfect facility of application to all the purposes for which such a standard is desirable. Again, after devoting so much time and expending so much labour on constructing their standard of line measure, the commissioners have not succeeded in producing two alike when measured at a like temperature, and this will be understood when it is remembered that a line once traced on the bar cannot be altered, and that the only means of correcting it if wrong is to change the temperature, so that the metal may expand or contract, until an approximation to accuracy is attained. Hence in the bill, a separate temperature is provided for each copy. On the other hand, the standards of end measure can be copied to any requisite extent, and any difference not smaller than the millionth of an inch will be readily detected. By taking care to make the copy slightly too long, its errors in excess may be gradually removed by repeated corrections, each of which may be measured until a complete *fac simile* is obtained. But further, in mechanics especially, where extreme delicacy of fitting and the production of accurate duplicates are of the greatest importance, standards for the foot and inch are even more necessary than those for the yard. For the supply of these the plan of the Royal Commission made no provision; whereas Mr. Whitworth is able to produce them in the same perfection as the yard standard. Finally, it affords a simple method of contrasting the merits of the two systems to state that in line measurement the eye has only to pass over the distance actually measured, and when that is very small the limited power of the sight, aided even by the microscope, in distinguishing

difference, operates as a great check; whereas in the apparatus employed in end measuring, the eye has to travel over a distance of about 40 inches to trace the variation of a thousandth of an inch. From all these considerations it is obvious—and the result is a highly instructive one—that a private manufacturer, pursuing steadily that course of experiment on which he well knows the success of his business to depend, has been enabled completely to distance the efforts of a body of highly scientific men, constituted expressly for the purpose, and working at it with no small expenditure of the public money during a period of sixteen years. Yet so oddly are such matters managed in this country, that the bill for legalizing the standards of weights and measures had passed the House of Commons, and was halfway through the House of Lords, before Mr. Whitworth's invention, publicly exhibited in 1851, recognized by the Admiralty and the Board of Ordnance, and generally accepted by all the leading machinists of the kingdom, was brought before the notice of the Legislature. Thanks, however, to the select committee of the House of Lords, and to the personal interest taken in the subject by Lord Hardinge, Earl Granville, and other peers, the blunder which was well-nigh being committed will now, we trust, for all practical purposes, be avoided. Mr. Whitworth was examined before the committee yesterday and on Wednesday. He produced and explained his measuring machine, and so satisfactory has his evidence been, that we understand the committee have come to the decision of recommending that his standard yard measure, constructed of the same length as that of the Royal Commission, be legalized as the "secondary standard," for comparison with local standards of measure throughout the country, and that his standard foot and inch have the same sanction attached to them. No doubt this will now be effected by an amendment in the present bill, for if left to a new measure, or to an order in Council, there is no telling when it may be carried out. To those who have paid any attention to the state of industry in England, it is unnecessary to point out the immense advantage which we possess in the extraordinary finish which, in mechanics especially, we impart to our workmanship. This arises from the attention which has been paid to two objects—one the formation of a true plane, the other the power of measurement, carried to a point as near as possible to perfection. There was a time when in the machine shops throughout the country "the big inch," "the middling inch," and "the little inch" were all recognized, and even still there are important branches of manufacture — such as, for example, the gun trade — in which the gauges used hardly deserve the name. To legalize therefore the best standards of measure that can be obtained is a matter of national importance, and we rejoice that even at the eleventh hour steps are being taken to avoid in this respect a serious legislative blunder.

THE ROYAL OBSERVATORY.

The annual visitation of the Greenwich Observatory was held on Saturday last. Lord Wrottesley, as President of the Royal Society, presided at the Board of Visitors. The various buildings and instruments were inspected; after which the Astronomer Royal laid his twentieth Annual Report before the Board. Under the head of "Grounds and Buildings," it is stated that the fire-proof room, so necessary for the safe custody of the invaluable papers belonging to the Observatory, is expected to be finished very soon. The new building, for the reflex zenith-tube, will also be completed in the course of the present summer. The magnificent transit-circle is in perfect order, and continues to give the greatest satisfaction. At the recommendation of the Royal Society, a full-sized model of this fine instrument, and sectional and working models, on a smaller scale, showing its internal peculiarities, have been made and sent to the Paris Exhibition.

The barrel-apparatus, for the register of transits by punctures produced by galvanic communication, has been in constant use without suffering injury, except in the parts exposed to continual friction, which require occasional attention. The method of giving the time-second signals from the transit-clock is found to be perfectly successful. The insulation of the touch-apparatus has sometimes failed in very damp weather; but when the sky has cleared, the moistened gutta-percha has become dry so speedily, that very few transits have been lost.

With respect to the galvanic magnet apparatus, for dropping the time-signal ball, the Astronomer Royal observes, that "it has been found desirable to guard against the risk of permanent magnetism, by causing the apparatus itself to reverse the poles of the battery at every drop of the ball." When arrangements were originally made for exhibiting the London currents upon the transit-clock needle, and for sending currents to and through London by the touch apparatus of the transit-circle, in order to avoid disturbing the ground, the wires were so connected by turn-plates, that one of the wires of the barrel-apparatus was used for these purposes; but, with the increased facilities now possessed for laying wires, it is

intended to make the barrel-apparatus wires entirely independent of the others, preserving, however, the power of connecting the touch apparatus with the London and foreign wires.

The time-signal ball at Deal was brought into regular use at the beginning of the present year. At first, its action was interrupted, partly by derangement of the apparatus, and by the freezing of the sulphuric acid. These irregularities were corrected, and it now acts extremely well. The machinery is so contrived that the action of the ball at Deal is communicated, by signal, to the Observatory, and the entire apparatus works so admirably, that the Astronomer Royal has no hesitation in recommending its extension to government.

Application has already been made by the latter for a systematic galvanic regulation of the public clocks under their care, and the Astronomer Royal has devised a plan of effecting this, which he "thinks likely to prove the beginning of a very extensive system of clock regulation." Mr. Shepherd is at present engaged in preparing estimates of the expense.

* * * * *

During the past year, another very important astronomical work has been performed, by which the difference of longitude between Paris and Greenwich has been ascertained. The number of days considered available for longitude, in consequence of transits of stars having been observed at both observatories, was 12; and the number of signals was 1,703. Very great care was taken on both sides for the adjustment of the instruments. The resulting difference of longitude, 9′ 20″·63, is probably very accurate. It is less by nearly 1″ of time than that determined in 1825 by rocket signals under the superintendence of Sir John Herschel and Col. Sabine. The time occupied by the passage of the galvanic current appeared to be one-twelfth of a second.

The Astronomer Royal regrets that, while the Greenwich astronomical observations have assumed such a shape that the astronomer will find all the moving bodies of the solar system presented in the utmost extent and accuracy, the same assertion cannot be applied to the magnetical and meteorological observations;—not, however, from any defect in the instruments or observations; for, under the able superintendence of Mr. Glaisher, these have acquired an extraordinary excellence and precision, particularly in the photographic branch of registration. "But," to use the words of the Report, "after having obtained the immediate results of observation with the utmost completeness and exactitude, we are absolutely stopped from making further progress by the total absence of even empirical theory."

At the same time, the system and extent of the observations continue unaltered. For the three magnetic elements, and for the barometer and the dry and wet thermometers, eye observations are made three or four times daily; and these serve as zeros both in time and in measure for the curves formed by continuous self-registration on the photographic sheets. Thus, whenever any extended view of the cosmical causes or laws of magnetism and meteorology shall render an accurate discussion of observations of these phenomena practicable, those made at Greenwich will be found to present such materials for the investigation as can scarcely be obtained at any other observatory.—*Athenæum.*

ON THE MINING RESOURCES OF FRANCE.

A paper on the above subject was recently read before the Statistical Society, by H. R. Lack, Esq. The author commenced by showing the progress made in the various branches of French mining industry in 1852 as compared with that of 1841. He stated, that besides a large increase in the production of coal and iron, which formed the chief part of its mineral productions, a considerable increase in that of copper, silver, and lead had also taken place of late years, and that upon the whole the mining industry of the country was assuming a more active spirit. The total amount of coal raised in France in 1841 was 3,410,200 tons; and in the year 1852, 4,816,350 tons. The value of the iron and steel made in 1841 amounted to £5.671,582; and in 1852, to £11,893,227. The copper produced £11,147 in 1841, and £206,693 in 1852. The silver, £18,340 in 1841, and £54,160 in 1852; and the lead, £12,559 in 1841, and £41,446 in 1852. The quantity of iron produced in France was fourfold that produced in Russia, and the quantity produced in Great Britain was fourfold that produced in France. The subject was also considered in relation to the production of coal and iron in the principal iron manufacturing countries of the continent. The falling off in the quantity of French coal used for home consumption, and the increase in the amount of foreign coal imported (two-thirds of which was from Belgium in 1852), was noticed as a somewhat remarkable feature; and it stated, that since the reduction of the import duties in 1853, the import of coal from Great Britain had considerably increased. With regard to the production and manufacture of iron, it appeared that the amount of iron ore raised in 1852 was less than in 1847—a fact attributed to the revolution of 1848—which dealt a severe

blow to the mining industry of the country. The value of the country and steel manufactures, as stated above, increased very largely in 1852, as compared with 1841. It also showed that the late reductions in the iron duties had had the effect of increasing the importation of that article in which Great Britain had shared, and finally pointed out the successful competition of Belgium with this country of late years in furnishing France with coal, and pig and various kinds of manufacturing iron.

WROUGHT-IRON ORDNANCE.

MUCH interest was excited on Monday by the appearance, on the open space before the War-office, Whitehall, of a beautiful nine-pounder gun, of polished steel, on its carriage, with limber complete. This gun, which in the course of the day was minutely examined by Lord Panmure, and by many members of both Houses of Parliament, is of malleable or wrought-iron, invented and manufactured by Mr. Dundas, of Dundas Castle, North Britain. Perhaps it would be premature to describe minutely the method of construction of this gun, but the principle is such that it can be extended to cannon of the largest calibre, and the inventor is confident that he can construct with ease and rapidity guns to throw shot of a ton weight, if desired. Great additional strength is obtained by the reed of the iron being so disposed, as in a twisted gun-barrel, as to resist most effectually the bursting power of the powder. The gun can thus be made much lighter than cast-iron ordnance. Indeed this wrought-iron gun is 10 cwt. lighter than a cast-iron gun of the same calibre. Though heavier than a brass nine-pounder, it is considerably longer, by which a greater range is attained. The great difficulty in making wrought-iron cannon hitherto has been the attempt to make them out of solid masses. It is well known to all mechanics, that nothing is more rare than to obtain heavy forgings perfectly solid, and few very large shafts or cranks can be produced without a flaw, while continued hammering only increases the evil. In Mr. Dundas's gun this obstacle has been overcome, and the perfect strength and trustworthiness of the piece has been proved by 24 service charges having been already fired from it with results entirely satisfactory. As regards cost of production, taking into consideration the greatly diminished weight of metal required as compared with cast-iron, the wrought-iron nine-pounder gun will hardly exceed in cost a cast-iron cannon of similar bore, while brass ordnance will exceed the malleable iron in expense by about four times the cost of production. On the comparative durability of the two materials it is superfluous to say a word. In the course of Monday evening the gun was, by Lord Panmure's order, conveyed to Woolwich, under the charge of a party of Artillerymen. At Woolwich, it is understood, the gun will undergo a severe ordeal to test its efficiency.—*Times, June* 13.

ON THE DESTRUCTION OF RUSSIAN FORTRESSES.

WE call the attention of our readers to a letter which appeared in the *Morning Advertiser* a few days since, and in which the writer, who signs himself "A Satirist, but one not too bitter for the times," after speaking at length upon the subject of Government misrule, and paying a well-merited compliment to the known skill and bravery, the recognized public services, and the recent arduous efforts of the Earl of Dundonald in the service of his country, proceeds to notice the invention of an old correspondent of this journal, Mr. Isham Baggs, and to detail the manner in which his papers, directed to the same object, and marked PRIVATE, were appropriated by the Honourable Board of Admiralty, and securely stacked in their official pigeon-holes. Since the publication of this letter, we have seen the inventor, and have obtained from him further information as to his views and intentions, and additional details as to the past history of this new and powerful but neglected engine of warfare. Foiled in his efforts to obtain Governmental support, the inventor hopes to effect by private enterprise what he has failed in accomplishing through the usually recognized sources of power and advancement. He is willing, on the guarantee of £20,000 *conditionally*, to submit his views *in extenso* to a scientific committee of three persons—the one a civil engineer, another a chemist, and the third a professor of natural philosophy, chosen by the contributors, and approved by himself, and who have none of them any inventions or ideas directed to the same object. The £20,000 to be expended, not in experiments, but in the realization of an immediate practical result, whereby not only will the strongholds of barbarism be shaken to their foundations, and a tolerable stop be put to the encroachments of ill-acquired power over human right, but, upon a rational calculation, no less than a million sterling will be gained by the adventurers, in the shape of fairly-acquired treasure, within six months, with the consent and partial assistance of Government, of course, and without—what then? By other means, perfectly constitutional, and not violating, in the remotest degree, the established laws of the realm.

We have only to state, in addition, that any communications from capitalists in reference to the above subject, and directed to the inventor, at our office, will meet with prompt attention.—*Mining Journal.*

PREPARATION OF OXYGEN BY THE DECOMPOSITION OF WATER.

The following suggestion of a mode of preparing oxygen on a large scale is published by M. D. Muller, in the *Comptes Rendus* of April 16.

Two very important facts served as a starting point—1. An aqueous solution of chlorine, contained in a glass receiver, is gradually converted into hydrochloric acid; the oxygen remains free. 2. In all circumstances, the chlorine and hydrogen combine immediately under the influence of heat. There is, therefore, nothing more natural than to turn this great affinity of chlorine for hydrogen to account, in order to decompose steam at a high temperature. Under the influence of heat, the chlorine combines with the hydrogen of the steam, and is converted into hydrochloric acid in the gaseous state; the oxygen remains free, part of which might combine with the chlorine and form perchloric acid; but the greater part remains free, mixed with hydrochloric acid gas. On passing the mixture into a vessel containing water, the gaseous hydrochloric acid is immediately dissolved, and the oxygen may be collected alone. The temperature proper for this operation is about 120° C. (248° F.)

TABLES FOR FACILITATING ADDITION.

To the Editor of the Mechanics' Magazine.

Sir,—Addition may well be called, especially since the invention of logarithms, the fundamental operation of practical arithmetic; and it is well known, that to make long and numerous additions by the common method, considerable labour and attention are required, which do not even lead to results so trustworthy as not to require what is called a proof, in itself as tedious as the first addition. These considerations have induced me to search for a mechanical way of making additions, which should be as simple as possible, allow great rapidity of operation, give results perfectly trustworthy, and, of course, require no labour of the mind for its application. The accompanying table, No. 1, is the result of my efforts to satisfy all those conditions. I will proceed to describe it, but shall abstain from further comments on it, as it is only by its *actual use that its* merits, if it has any, can be tested. I must yet mention, that Pascal's arithmetical machine can be employed for making additions; but that this machine was not devised especially for making additions, and is, by the diversity of its operations, rather a display of wonderful ingenuity than a really practical instrument.

It is seen by inspection of Table 1,* that points are arranged on it in sets of three, and that three such successive sets are

II.									I.	
									9_0	○
								9_1	1	●
							9_2	1	2	●
						9_3	1	2	3	●
					9_4	1	2	3	4	●
				9_5	1	2	3	4	5	●
			9_6	1	2	3	4	5	6	●
		9_7	1	2	3	4	5	6	7	○
	9_8	1	2	3	4	5	6	7	8	○
9	1	2	3	4	5	6	7	8	9	○
1	2	3	4	5	6	7	8	9	10	●
2	3	4	5	6	7	8	9	1	11	●
3	4	5	6	7	8	9	1	2	12	●
4	5	6	7	8	9	1	2	3	13	●
5	6	7	8	9	1	2	3	4	14	●
6	7	8	9	1	2	3	4	5	15	●
7	8	9	1	2	3	4	5	6	16	○
8	9	1	2	3	4	5	6	7	17	○
9	1	2	3	4	5	6	7	8	18	○
1	2	3	4	5	6	7	8	9	19	●
2	3	4	5	6	7	8	9	1	20	●
3	4	5	6	7	8	9	1	2	21	●
4	5	6	7	8	9	1	2	3	22	●
	•		•		•	•		•		•
1	2	3	4	5	6	7	8	9_0	100	●
2	3	4	5	6	7	8	9_1		1	●
3	4	5	6	7	8	9_2			2	●
4	5	6	7	8	9_3				3	●
5	6	7	8	9_4					4	●
6	7	8	9_5						5	●
7	8	9_6							6	○
8	9_7								7	○
9_8									8	○

again distinguished from each other. Now, suppose I wish to add together any digits, as 4, 9, 5, 6, 8, 3, 7, 1. I take in my hand a sharp instrument, say a pencil, and start

* We have been compelled to shorten these Tables considerably, but enough of them is given to exhibit their construction.—Ed. M.M.

with its end from the first point (which is opposite the figure 9_0). Now I count four points in descending order. For that purpose, I descend first to the point vertically under the first, which is the third from it, and pass to the next, which is the fourth from it. The second given digit being 9, I have now to count nine points from the one just arrived at, which is done at once by passing to the point which has the same situation relatively to the next of the rectangles containing nine points, in which the table is divided by cross-lines, as the one I leave has relatively to its rectangle. The third digit being 5, I must now count five points from the one just arrived at, which is done by counting three, by means of a vertical motion downwards to the first point met with, and then by counting two more. The fourth digit is 6; I therefore count twice three in the above manner from the point I leave, or, in other words, pass to the second point vertically below it. The fifth digit is 8: I count six as just stated, and then two more, &c. When I have thus taken into account all digits, I find in the column of numbers at the left hand, the number 43 opposite the last point arrived at, and I say that this number is the sum of the given digits. For, since there is one and only one point opposite each of the numbers of the series from 1 to 100, it is evident that we should have arrived at the same number, 43, if we had counted successively in descending order, 4, 9, 5, &c., numbers of that series, beginning at the top; and, in that case, 43 would have been the required sum by the principle of addition itself.

If we have to add a long series of digits, whose sum is greater than 108, we shall, when arrived at one of the points of the last rectangle, mark somewhere aside a unit of hundreds, and continue to use the Table from the point of the first rectangle which has the same figure opposite to it as the inferior point, or, if this latter point have 100 opposite to it, from the first point (opposite 9_0). Should we arrive several times at the last rectangle, we should each time mark a unit of hundreds, and should take care to add them all to the number less than 100 at last found in the column at the left.

If we have to make a common addition of any numbers greater or less than 9, we shall add, as above, each column of digits. If the sum of such a column be less than 1,000, we shall have to carry a number < 100, and we shall do this by beginning the addition of the next column to the left of the given addition from the point opposite the number to be carried over on the Table. If the number to be carried over be > 99, we shall treat its units of hundreds as above. Thus the whole addition can be made.

Should a person read the digits of the proposed addition whilst another employs the Table, the addition would be performed with a rapidity equal to that of simple reading, and with an almost perfect certainty of accuracy.

If only one person performs the addition, he will have to bring the Table as near as possible to his written addition, and then to read four or five digits to be added, at a time, to avoid passing too often from the addition to the Table, and *vice versâ*.

Table II. will not allow as great a rapidity of adding as Table I. To add the digits, proposed above with this Table, I start from the figure 9_0 at the top, descend vertically to 4, pass horizontally to 9; descend again vertically to 9, then to the first 5 I meet, and pass horizontally to 9, and so on, passing after each digit thus added, horizontally to 9, unless this digit be itself 9. When arrived thus at the last digit to be added, I find the required sum opposite to it in the column on the right. It is not necessary to explain this Table further, as most of what has been said of the first Table can be applied to this. The superior and inferior nines have indices, in order that when arrived at one of the inferior ones, we may immediately resume the process from the superior one having the same index, after having, of course, marked a unit of hundreds.

The second Table will, perhaps, offer a little more convenience than the first, and will certainly give perfectly secure results, when the far greater rapidity attainable with the first can be sacrificed.

I am, Sir, yours, &c.,

C. J. RECORDON.

Cambridge, 1855.

ON TUBULAR BOILERS FOR THE EXPANSIVE USE OF STEAM.

To the Editor of the Mechanics' Magazine.

SIR,—I regret I had not time last week immediately to thank Mr. Williams, in your last number, for his candid admission of the justice of my criticism on the passages referred to in his work on combustion, and of the injustice done to Mr. Craddock by their tenor. Intentional misrepresentation is, I conceive, quite out of the question where Mr. Williams is concerned. It seemed clear to me that, entirely annoyed at the violation of all his principles by the introduction of the multitubular boiler to the raw coal of the marine service, Mr. Williams was quite preoccupied, so as not to think for a moment of the existence of the opposite kind of tubular boiler. Warring against the word

"tubular" with an undivided indignation, he selected four or five passages containing it, from the "Lectures," without reference to the context of close argument which united them, and its whole purpose and object. But for this prepossession Mr. Williams, whom I must not consent to level to a "general reader," would have plainly perceived that the objections themselves, enumerated by Mr. Craddock, are not quite applicable to the present marine tubular; and by noticing the date of the work (erroneously quoted as lately published), it would have appeared that very few, if indeed any, of that sort of boilers were at that date used at sea. I readily admit there is nothing extraordinary in overlooking very valuable parts of treatises. There is a most important part of Mr. Williams's own treatise, the explanation of *currents* in reference to boiler explosions; yet, notwithstanding the great interest and discussion at present on the question of explosion, I have not seen the least notice of this most invaluable portion of the work. This, it would seem, must needs be the fate of sound treatises. I could name half-a-dozen, upon important questions, under continual controversy, which are like diamond drops falling into the ocean of ephemeral steam printing, unnoticed and undiscernible by the multitude, until the passing flood has left them high and dry. Few care for deep research whilst they can read day by day the efforts of the finest energies devoted to the demolition of trumpery statesmen. Truths always make slow progress; it is much more generally agreeable to argue and debate than to understand and do. The motto of permanent writers must be taken in that line of our great poet:

——"fit audience find though few."

The refined Fontenelle long since told us, in *his* "Plurality of Worlds," which has had such lumbering imitators, that all our science is nothing but a means to remedy defective senses; and Dr. Brown elaborated the idea in a thick octavo. It is neither to be wished nor expected that ordinary affairs should be conducted with microscopic and telescopic vision. Administrators of large concerns cannot give much time to abstract principles; but I like and rather expect to see the author of one sound treatise appreciating the merits of another.

I shall look with interest for Mr. Williams's demonstration, that a saving of weight, space, and coals, and a gain of fresh water is less applicable in the costly position of a ship at sea, than the accomplishment of the same items upon land. It is a fact which, if no one controverts, must be held incontrovertible, that for ten years past we have burned and are burning three times as much coal in our steam ships as there is any necessity for, and that in the face of the strong assertions of all public writers, that the burning ought to be diminished, and the diminution prove a public benefaction. No question, then, can hardly be of greater interest than the explanation of an experienced authority, how these savings are inapplicable. There is a steam ship now building, to carry 12,000 tons of coals and 5,000 tons of goods. Do no more than merely reverse these figures for the same power, would not that be putting on a screw almost as valuable as that which the engineers have lately been so nobly remunerating? To those who feed on noble sentiments, and live by triumph over their opposites, not many events are more gratifying than to see the public services of private men thus munificently recompensed; a sweet contrast to "the spurns that patient merit of the unworthy takes," and the more bitter fang of ingratitude.

I am, Sir, yours, &c.,
DAVID MUSHET.

P.S.—I am glad to see Mr. Nasmyth is again at work on his great guns. They are volcanos indeed. Mr. Nasmyth is an enthusiast in volcanos; and I notice Vesuvius has lately struck the chord of his sympathies, as one of the few practical men who continue to uphold the wild idea thrown out by Leibnitz, that our earth was originally a molten globule ejected from the sun,—a notion entertained (for what notions will men not entertain?) until physical science had dismembered the "four elements," and geological research destroyed the fiery dragon of the "primaries." I always recommend those bitten with this old mania to a cool walk over one of the bridges, in the attitude of that spirit

——"whose looks and thoughts
Were always downward bent, admiring more
The riches of heaven's pavement—"

and, pondering on the tesselated structure of each stone he passes over, ask himself what resemblance the beautiful aggregation of crystals seen in section beneath his feet bear to any slab of lava, pumice-stone, or pozzolana ever hurled by Cyclops out of Vulcan's smithy.

SPECIFICATIONS OF PATENTS RECENTLY FILED.

BEASLEY, WILLIAM, of Smethwick, Stafford, manufacturer. *Improvements in the manufacture of gun-barrels.* Patent dated November 21, 1854. (No. 2459.)

This invention consists—1. In an improved form of skelp for skelp-barrels. 2. In rolling iron of a peculiar section to be

employed in the formation of what are termed the lumps to be forged on to the breech of the barrel. 3. In straightening this description of barrel by employing a series of rolls, mounted horizontally, their axes forming the angles of an equilateral triangular, similar to those employed by the inventor for welding twisted gun-barrels, and described in the specification of his patent dated June 10, 1852.

TYLOR, ALFRED, of Warwick-lane, Newgate-street, London. *Improvements in crimping-machines.* Patent dated November 21, 1854. (No. 2460.)

The inventor claims making the bearings of crimping-machines of wood, and a mode of adjusting them.

HUNT, EDMUND, of Glasgow, Lanark, gentleman. *Improvements in screw propellers, and in ships or vessels.* Patent dated November 21, 1854. (No. 2461.)

This invention relates to various improved modifications of screw or oblique-bladed propellers, intended to obtain a better propelling effect than has hitherto been secured by means of propellers of this class, and to a mode or modes of constructing ships or vessels so as to render them more suitable for screw propulsion, a portion of these improvements being also applicable to paddle steamers, sailing ships, and other vessels. We shall probably give an illustrated description of this invention hereafter.

BAGARY, JEAN BAPTISTE, stockholder, of Paris, France. *Improvements in sawing apparatus.* Patent dated November 22, 1854. (No. 2463.)

This invention relates to saws used for dividing whalebone, horn, &c., by hand, and comprises—1. The use of a piece of metal or other suitable material for holding down the block to be operated upon, this piece acting also as a guide for keeping the saw-blades at a constant distance apart. 2. A method of suspending the saw frame between friction-rollers acted upon by screws on one side, and slides acted upon by springs on the other.

TERRET, RICHARD, of Hercules-buildings, Lambeth, Surrey, machinist. *An improved machine or apparatus for cleaning knives.* Patent dated November 22, 1854. (No. 2464.)

The principal feature of this invention consists in the use of a suitable elastic bed placed between the wood and the leather surface which acts upon the knife, so as to impart increased elasticity to the latter surface.

JOHNSON, JOHN HENRY, of 47, Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the manufacture of piled goods, and in the machinery or apparatus used therein.* Patent dated November 22, 1854. (No. 2465.)

This invention comprises a great number of features: amongst them a novelty in the general construction and arrangement of looms and apparatus connected therewith for weaving double piled goods or fabrics, —a peculiar construction and arrangement of knife (and apparatus for sharpening the same) employed in cutting or dividing the double fabric—an improved mode of working the suspension or trap boards in the Jacquards attached to looms for weaving figured pile fabrics, &c., &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the prevention or removal of incrustation in steam-boilers.* (A communication.) Patent dated November 22, 1854. (No. 2466.)

Claims.—1. The use of the refuse scraps of various kinds of leather or raw hides for the purpose of removing and preventing the incrustation in steam-boilers. 2. The mode of converting strips and cuttings of leather or raw hides into a compact mass or to a powder to be introduced into steam-boilers or generators.

GIBSON, ROBERT, of Hunslet, Leeds, York, engineer. *Certain improvements in machinery for carding wool, flax, cotton, and other fibrous materials.* (A communication.) Patent dated November 22, 1854. (No. 2467.)

This invention relates—1. To the use in carding engines of a series of small cylinders in the place of the ordinary large cylinder or swift employed in carding or scribbling fibrous materials, which small cylinders are so arranged that the delivery of the fibrous material operated upon shall be consecutive from one cylinder to the other until it reaches the doffing roller. 2. To the adaptation to this system of cylinders of carriers placed beneath them so as to facilitate the working of the material operated upon, by detaching the loose fibre which may have been emitted to be taken up by the cylinder next it, and delivering it or lashing it upon the cylinder which should have taken it. 3. To the adaptation of workers and strippers, or workers and fancy rollers to the above-mentioned system of cylinders, which rollers are placed above the cylinders, and will, if requisite, carry back the material under operation to the cylinder it had just left there to undergo a repetition of the carding operation.

VÉREL, WILLIAM ARISTIDES, of Macduff, Banff, merchant. *Improvements in grinding or pulverising bones.* Patent dated November 23, 1854. (No. 2471.)

Claim.—The substitution of grinding stones by means of which bones can be reduced to a powder for the ordinary iron-toothed rollers used in bone mills.

EABORN, EDMUND and MATTHEW ROBINSON, engineers, and JOHN KENDRICK, accountant clerk, all of Birmingham, Warwick. *Certain apparatuses or contrivances for holding hats in churches, chapels, and other public assemblies.* Patent dated November 23, 1854. (No. 2472.)

Claim.—"The application to forms, stalls, or pews, of a suitable means, whereby the male occupants of such seats may be provided with a rest for his or their hats"!

CRICKMAY, CHARLES, of the Lozells, Handsworth, Stafford, gun manufacturer. *Improvements in single and repeating, or revolving fire-arms, and in the mode of attaching bayonets to breech-loading fire-arms.* Patent dated November 23, 1854. (No. 2473.)

This invention consists—1. "In connecting the barrel and stock, or lock part of breech-loading fire-arms, by a stout immoveable pin, or bar, on which the breech revolves; and at the base or back of, and around such pin, where it unites itself with the lock or stock, are two or more inclined planes, their lines of inclination rising towards the muzzle of the gun; and in connection with these inclined planes are counter inclined planes attached to a spring lever, which, working on the pin bar or breech, and the breech or counter breech, being placed between the barrel and the spring lever, it is evident, that as such lever is made to revolve against the inclined planes, that the breech or counter breech is forced into complete contact with the barrel, the end of which, being a frustum of a cone, and that part of the chamber, or counter breech, in contact with it being countersunk, the union is of the most perfect kind. 2. In forming the pin or bar on which the breech revolves, in such a way, that I" (the inventor) "may dispense with the base, or projecting part for the inclined planes; and in that case I allow such pin or bar to extend long enough to be united to the part that carries the lock and stock, by screwing or otherwise, the inclined planes being formed on that part, and the counter inclined planes attached to the lever, so as to be applied as before described. 3. In applying to such fire-arms a self-priming apparatus, which consists of a hollow chamber for containing percussion caps placed in such a manner that as the nipple comes before an aperture in such chamber a cap is placed thereon by a spring or other suitable means. 4. In attaching bayonets by a hinge joint near the muzzle of breech-loading fire-arms, so that the blade thereof shall lie on the underside of the barrel when out of use, but which will instantly fix itself for use by relieving a spring or detent."

COLLIER, GEORGE, of Halifax, York. *Improvements in the manufacture of mohair-plush.* Patent dated November 23, 1854. (No. 2474.)

Claim.—The employment of singed yarns as the warp yarns in the manufacture of mohair-plush.

COLLIER, GEORGE, of Halifax, York. *Certain improvements in the manufacture of pile fabrics and other weavings.* Patent dated November 23, 1854. (No. 2475.)

Claims.—1. So arranging and combining parts of looms for weaving pile fabrics, by the aid of pile wires laid longitudinally of the fabric, that such pile wires may have given to them a reciprocating motion in the direction of their length, in order that the knife edges formed on or affixed thereto may effect a quicker cutting-open of the pile loops. 2. A mode of arranging, combining, and working mechanical parts as described, for the purpose of conducting the points of pile wires (used transversely of the fabric) as they are withdrawn from the fabric into position for re-entering the open shed, and of stopping the motions of the loom when a wire fails. 3. Forming reeds used in weaving with certain of the dents fixed at one end only, and others fixed at both ends in the ordinary way.

SHAW, STEPHEN, of Plaistow, Essex. *An improved mode of marking metal plates for riveting or bolting, and the application of a new material as a template for receiving such marks.* Patent dated November 23, 1854. (No. 2476.)

This invention mainly consists in employing a marker composed of vulcanized India-rubber, and a colouring material, in marking templates and transferring the marks made upon them to the plates to be punched.

DUVIVIER, HENRI JULES, and HENRI CHAUDET, both of Rue de la Glacière, Paris. *Improvements in treating gutta percha.* Patent dated November 23, 1854. (No. 2479.)

This invention "consists in treating gutta percha with one or more of the following substances:—Chloride of sulphur, bromide of sulphur, iodide of sulphur, fluoride of sulphur; chloride of phosphorus, bromide of phosphorus, iodide of phosphorus, fluoride of phosphorus, sulphide of phosphorus; chloride of boron, bromide of boron, iodide of boron, fluoride of boron; chloride of silica, bromide of silica, iodide of silica, fluoride of silica; chloride of arsenic, bromide of arsenic, iodide of arsenic, fluoride of arsenic; and the bichlorides of tin and antimony of these substances."

CARPENTER, SAMUEL ALFRED, of Birmingham, Warwick, manufacturer. *A new or improved buckle or substitute for a buckle.* (A communication.) Patent dated November 24, 1854. (No. 2481.)

Claim.—"A new or improved buckle or

substitute for a buckle, in which the fastening of straps, bands, or belts is effected by the compression or wedging of the same between the two parts of which the said buckle or substitute for a buckle is composed."

CUNLIFFE, RILEY, of Accrington, Lancaster, surveyor. *Improvements in machinery or apparatus for making or manufacturing bricks and tiles. or other similar articles.* Patent dated November 24, 1854. (No. 2483.)

This invention relates to the manufacture of bricks and tiles by means of a machine in which the pressure is communicated directly from the beam of a steam engine, from the piston-rod of a steam cylinder, or by means of a crank or eccentric, and it consists, says the inventor, "of a hopper into which I put the clay, from whence it passes into moulds and is conveyed under a presser by means of a ram worked by levers and connecting rods."

WILLAN, ROBERT, and DANIEL MILLS, of Blackburn, Lancaster, machine-makers. *Improvements in looms.* Patent dated November 24, 1854. (No. 2484.)

This invention consists—1. In making the shuttle-box of metal, and grooving it on each side so that a small carriage may slide to and fro in the grooves each time the pick is made. Through this carriage is passed a piece of leather thong or similar substance, so as to form a loop underneath it, and as the carriage slides in the grooves above the shuttle, when the shuttle enters the box the point of it passes through the loop, which then presses against the shoulder or thick part of the shuttle, and acts as a partial stopper to prevent the shuttle rebounding. The invention consists—2. In forming on the fly-wheel and break projections which come in contact, causing a positive stop, and compelling the shuttle to remain in one box when the loom is at rest.

HARTLEY, JAMES, of Sunderland. *An improvement in the manufacture of perforated glass.* Patent dated November 24, 1854. (No. 2485.)

This invention consists in employing a number of circular mills or cutters fixed on an axis and caused to rotate, and in their rotation to bring up water and grit, and thus to act on the glass as it is gradually pressed to the cutters or mills.

ELEY, WILLIAM, of Broad-street, Golden-square, Middlesex. *An improvement in the manufacture of ball-cartridges.* Patent dated November 24, 1854. (No. 2487.)

This invention consists in fixing to balls flexible cases to contain powder. A projecting tang is formed on each ball, and on it a paper or flexible case is fixed by means of a perforated disc placed on the tang in such manner as to shut the end of the case between the disc and the ball, and the tang is then subjected to pressure which upsets its end and fixes the case and the disc to the ball.

STIRLING, JOHN DAVIE MORRIES, of Blackgrange, Clackmannan. *Improvements in the manufacture of metallic tubes.* Patent dated November 24, 1854. (No. 2488.)

Having formed certain hollow ingots and heated them to the requisite degree of heat, the inventor proceeds to roll or extend them by means of grooved rolls. He takes a mandril of the dimensions corresponding to the internal diameter of the ingot and passes it into the tube, so that the end of the mandril shall be at or within the end of the tube to allow the rolls to seize the tube, drawing it through between the grooves and thus over the end of the mandril.

BESSEMER, HENRY, of Old St. Pancras-road, Middlesex. *Improvements in projectiles, and in guns or ordnance used for discharging the same.* Patent dated November 24, 1854. (No. 2489.)

Claims.—1. Giving a rotary motion to projectiles used in ordnance of various kinds by the reactive force occasioned by the emission of a part of the exploded charge of powder used to propel the said projectile, the gases so emitted passing through tangential apertures formed therein. 2. Giving a rotary motion to projectiles used in ordnance of various kinds by exploding a charge of powder within them simultaneously with the explosion of the usual charge contained in the piece of ordnance, and by causing the gases produced by the charge contained in the projectile to escape therefrom by tangential apertures. 3. A mode of causing the exploded powder used in ordnance to act upon a larger propelling surface than is presented by the projectile by encasing it in the manner described. 4. The use of chambers in ordnance used to discharge elongated projectiles, the entrance to such chambers being equal in size to the bore of the gun. 5. The making of ordnance in parts or sections, which parts are held together by bolts passing through lugs and flanges. Also, a mode described of insuring the proper relative position of such parts, and the use of channels or spaces for the purpose of lessening the pressure of the exploded powder between the surfaces of any two separate parts of such piece of ordnance. Also the construction of separate carriages suitable for the separate parts of which a gun is constructed. 6. A mode of mounting heavy guns formed of parts or sections on rails and frames.

RUE, THOMAS DE LA, of Bunhill-row. *An improvement in the manufacture of compositions suitable for printing-rollers, printing-*

ink, and flexible moulds. Patent dated November 24, 1854. (No. 2490.)

Claim.—The application of glycerine in the manufacture of compositions used when making printing-rollers, printing-ink, and flexible moulds.

ROBERTS, RICHARD, of Manchester, engineer. *Improvements in machinery for preparing cotton and other fibres to be spun.* Patent dated November 25, 1854. (No. 2491.)

This invention consists—1. In the application of a novel combination of mechanism for giving an improved lashing motion to gill or other feeding apparatus of frames for "lashing" fibre into receiving combs, by which the fibre is held whilst the lashing frame retires to detach tufts. 2. In an improved combination of mechanism for giving the requisite motion to "lashing-frames," for receding from receiving combs whilst detaching tufts from the feed. 3. In the application of a comb or brush, or a presser compounded of a comb and brush, to retain the fibre in receiving combs whilst detaching tufts from the feed. 4. In the employment of an improved reciprocating carriage with a "shogging" or an ordinary comb (into which the fibre is pressed by a brush or nipper), by means of which the tufts of fibre are detached from the feeding apparatus and deposited in the receiving-comb without the intervention of a porter-comb.

GREENSHIELDS, THOMAS, of George-street, Derby. *Improvements in treating cotton waste that has been used by railway companies and preparing it to be used again.* Patent dated November 25, 1854. (No. 2492.)

This invention consists in treating cotton waste with a solution composed of white-ash, quick lime, and water.

BLUNDELL, WALTER, of New Broad-street, London, surgeon-dentist. *An improved apparatus for treating or preparing any part of the human body requiring to be surgically operated upon, for the purpose of totally benumbing the sense of feeling at the desired part of the human body.* Patent dated November 25, 1854. (No. 2494.)

This invention consists in an improvement upon the apparatus patented August 11, 1854,* by the inventor, which apparatus has the effect of cooling too suddenly the part to which it is applied. He proposes therefore by the present invention to remedy this objection, and to enable the fluid cooled by ice or any known freeing mixture to be applied with equal effect in most cases by the use and employment of an apparatus (termed a "graduator") so contrived and applied that the temperature of the part is gradually decreased from blood heat or thereabout until the desired benumbing effect is produced.

* See *Mech. Mag.*, vol. lxii., p. 211.

HOLLAND, JOHN SIMON, of Woolwich, Kent, engineer. *Improvements in large and small fire-arms, and in the preparation of their charges.* Patent dated November 29, 1854. (No. 2495.)

1. For small guns the inventor takes small iron wire and winds it round a centre core in layers, one over the other, forming right and left handed spirals. These are afterwards cemented or braised together by brass or gun metal so as to form one compact body. In the manufacture of cannons he uses rods or bars of somewhat larger size, but twisted round and cemented or braised together, or coated, as in the case of gun barrels. 2. He makes canister shot in pieces of such shape that they nearly or entirely fill the canister. 3. He forms shells or grenades with fragments of metal &c., placed between the powder and case, so that on the explosion of the missile each of these fragments becomes a separate missile. 4. He forms shot with spiral heads, and with steel centres when they are intended for breaching.

GILLOTT, JOSEPH, the younger, of Birmingham, Warwick, manufacturer, and HENRY GILLOTT, of Birmingham, manufacturer. *An improvement or improvements in metallic pens and new or improved machinery for the manufacture of metallic pens.* Patent dated November 27, 1854. (No. 2496.)

Claims.—1. Hardening the points of steel pens by heating them in a flame, whether urged or not by a blow pipe, and afterwards cooling the same by simple exposure to the air by directing a stream of air upon them. 2. Certain new or improved machinery described, for effecting the longitudinal and transverse grindings of metallic pens.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in the construction of inkstands.* (A communication). Patent dated November 27, 1854. (No. 2497.)

These improvements consist—1. In establishing, by means of a cock, a communication between the interior of the inkstand and the atmosphere through a small channel which crosses the tube to which is adapted the key of the cock. 2. In adapting to the cock a fixed or moveable sucking or forcing pump, consisting of a small hollow ball of vulcanized India-rubber perforated with holes.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in the manufacture of wrought-*

iron deflassieux wheels for locomotives or railway or other carriages. (A communication.) Patent dated November 27, 1854. (No. 2498.)

In carrying out this invention the several parts required for forming a wheel are first forged separately, then set together in suitable moulds, and then subjected to hammering or to hydraulic or other pressure.

DELACOUR, FELIX, of Paris, France. *Improvements in fire-screens.* Patent dated November 27, 1854. (No. 2499.)

The inventor forms screens of an incombustible material and fits them to the chimney-piece or fender, as may seem desirable, arranging them so as to fold or roll up into a compact form.

CLARKE, JOHN, of Leicester, mechanic. *Improvements in the manufacture of looped fabrics.* Patent dated November 28, 1854. (No. 2502.)

Claim.—A mode of combining mechanism, whereby the warp-threads carried by one set of guides are caused to be looped into the warp-threads carried by an opposite or another set of guides, without the intervention of needles.

RESTELL, THOMAS, of the Strand, Westminster, chronometer maker. *Improvements in umbrellas, parasols, and cases or covers, and walking sticks.* Patent dated November 28, 1854. (No. 2503.)

Claims.—1. The construction of umbrellas and parasols, the opening of which is effected by the pulling down of the runner or slide. 2. Several methods described of combining the parts of walking-stick umbrellas. 3. The construction of walking-sticks, and of the cases or covers of walking-stick umbrellas, of a mixture of paper and calico, linen, or other suitable textile fabric.

NEWTON, ALFRED VINCENT, of Chancery-lane, Middlesex, mechanical draughtsman. *Improvements in steam boiler and other furnaces.* (A communication.) Patent dated November 28, 1854. (No. 2505.)

Claim.—Certain means for contracting the passage or passages by which the flame and gases of combustion escape from the fireplace to the flues, "and for dividing or diverting the current of the flame and gases at that part of the furnace and thereby permitting the oxygen of the air or steam admitted in streams to the furnace to combine intimately with the gases of combustion, and effect the consumption of the smoke."

PETERSON, CHARLES, of Low Cliff Chale, Isle of Wight, esquire. *The application of a new vegetable substance to the manufacture of textile fabrics, and pulp for paper, card-board, papier maché, and similar purposes.* Patent dated November 29, 1854. (No. 2506.)

This invention consists in the use of the "Sea Tree Mallow" for the purposes described in the title.

KNIGHT, THOMAS, and STEPHEN KNIGHT, both of Southwark, Surrey, manufacturers. *Improvements in apparatus for heating water for baths and other purposes.* Patent dated November 29, 1854. (No. 2508.)

Claim.—The construction of a heating apparatus composed of a grate and a boiler furnished with suitable tubes and passages, such apparatus being capable of ready adaptation to an ordinary fire-place and chimney, the grate, in this case, answering the purposes of an ordinary fire-grate when required.

ABRAHAM, JOHN, of Standfield, Great Crosby, near Liverpool, Lancaster, gentleman. *Improvements applicable to draining.* Patent dated November 29, 1854. (No. 2509.)

Claims.—1. "The forming and use of perforations, holes, grooves or openings in the sides of drain-pipes or passages, which openings extend upwards from the outer to the inner sides of the drain in an angular direction, through which the liquid rises and percolates into the drain." 2. "Extending the ends of the drain-pipes or passages sufficiently above the surface to be drained to admit of their being readily 'flushed' with water, and in providing the heads of the pipes or passages with suitable moveable covers."

GOWLAND, GEORGE, of South Castle-street, Liverpool, Lancaster, chronometer and nautical instrument maker. *Improvements in the mariner's compass.* Patent dated November 29, 1854. (No. 2510.)

The invention relates to improvements in compasses having cards of spherical, cylindrical, or other similar form, with the points marked on their periphery in a similar manner to those described in the specification of a former patent of the inventor, dated July 15, 1853.

SMYTH, SYDNEY, of Hyson-green Works, near Nottingham. *An improvement in gauges for ascertaining the pressure of steam and other fluids.* Patent dated November 29, 1854. (No. 2512.)

This invention consists in applying a flat coiled spring above the vulcanized India-rubber or flexible diaphragm or partition of gauges for ascertaining the pressure of steam and other fluids, "by which combination when the flexible diaphragm or partition is pressed on and rendered convex outwards it will press the flat spring also into a convex form outwards, and thus, by the ordinary rack bar, give motion to the index hand."

HYDE, JOHN MOORE, of Bristol, iron ship-builder. *Improvements in iron steam ships, and in boilers and machinery for pro-*

pelling the same. Patent dated November 29, 1854. (No. 2513.)

This invention consists—1. In fitting to ships a one-bladed propeller so disposed that it may be turned up about its axis, when out of use, so as to fall altogether within the surface of the vessel. 2. In keeping the stern-posts of iron vessels short, and continuing the after one up by means of a lengthening piece of brass or other metal which will not affect the compass. 3. The construction of the steam engine boiler to be used in connection with the inventor's improvements by making it similar to the ordinary flue or tubular boiler, but divided into two or more horizontal surfaces of water within the same shell, and so arranged that the flues or tubes in each division pass through each body of water, and the steam spaces of each division communicate together. Also in the construction or arrangement of the engine for propelling the ship, an intermediate receiver being introduced between the cylinder and condenser to collect the oil and tallow usually carried by the steam from the cylinders into the condensers of surface condensing steam engines.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

THOMAS, WILLIAM LYNALL, of Anderton, Devon, gentleman. *An improvement in projectiles and in gun-wads.* Application dated November 21, 1854. (No. 2462.)

This invention has for its object the affording of a supply of air, in safe and proper quantity, between the projectile and the powder or other explosive material employed to propel the projectile, and this is effected either by the projectile itself, or by means of a wad constructed as hereafter explained. When by means of the projectile itself, the inventor forms an air-chamber in the back of it and covers over the bottom or that end which comes nearest the powder with paper or other suitable material; and when by means of a wad, he constructs it with a conical or wedge-shaped aperture therein, the apex of the cone or top of the wedge being at that part of the wad which is placed farthest from the powder or other substance used to propel the projectile; the base or lower part of the wad is covered with paper or other suitable material of sufficient strength to prevent its being torn away in loading, yet weak enough to yield readily on the firing of the powder.

GIBSON, CHARLES, of Draycott, Wilne, Derby, gentleman. *Improved machinery for manufacturing bricks, tiles, and drain-pipes.* Application dated November 22, 1854. (No. 2468.)

"I mount," says the inventor, "the moulds, which are open at top and bottom, either in a circular or a rectangular frame (preferring to arrange them in pairs), and I cause them to move alternately under the hopper or clay box to receive the clay to be moulded, and under a descending piston or plunger by which the moulded articles are discharged on to a traversing endless band."

HURST, WILLIAM, of Salford, Lancaster, engineer. *Improvements in railway chairs.* Application dated November 23, 1854. (No. 2469.)

This invention mainly consists in forming railway chairs by rolling iron bars of a suitable sectional shape, and then cutting them into short lengths.

WRIGHT, JAMES, of Alfred-place, Newington-causeway, and JOHN WALMSLEY, of the same place. *Improvements in the construction and adaptation of bedsteads.* Application dated November 23, 1854. (No. 2470.)

The inventor describes a bedstead which carries a washstand, drawer, &c., and which may be converted into a table, desk, &c.

HEILLER, JEAN BAPTISTE, manufacturer, of Schelestadt, French Empire. *Certain improvements in machinery for throwing or twisting cotton, wool, flax, silk, and other fibrous substances.* Application dated November 23, 1854. (No. 2477.)

This invention has for its object the throwing or twisting of cotton, &c., at one operation, by means of certain improved machinery in which two or more reels supply the threads which unite in a glass tube inserted in a crossbar, and then pass into a vessel containing gum-water, whence they proceed through a grip lined with cloth that removes any excess of gummy liquid, and causes them to adhere to each other. The threads then pass over rollers or cylinders of different diameters and are wound several times round them, being transformed into a twist during the process.

RAMIÉ, CHARLES WILLIAM, of Jersey, gentleman. *An improvement in strops for sharpening razors, surgical instruments, and other like articles.* Application dated November 23, 1854. (No. 2478.)

This invention consists in adapting the shape of razor strops, &c., to that of the curve existing between the back and edge of the instrument.

CULPIN, THOMAS, of Devonshire-terrace, Blackheath-road, Greenwich, Kent, engineer. *Preventing waste of water, to be called a self-closing cock or waste-water preventer.* Application dated November 24, 1854. (No. 2482.)

The inventor describes a valve which is retained in a closed position by the pressure of the water coming through the service-pipe, passing a certain orifice, and acting against a piston, the amount of the pressure depending upon the extent that the

area of the piston is greater than that of the valve.

MOTAY, CYPRIEN MARIE TESSIE DU, of Paris, chemist. *An improvement in treating soap to obtain back the fatty or oily matters in their original state.* Application dated November 24, 1854. (No. 2486.)

This invention is applicable to soaps manufactured of tallow, palm oil, and cocoa-nut oil, and consists in well mixing the same with hydrate or carbonate of lime, and then adding a solution of carbonate of soda till it is saturated. The soap obtained by the above process is washed frequently with cold water until the fatty bodies are entirely separated; these are then taken out and melted in water as usual.

HENDERSON, JOHN, of Lasswade, Midlothian, gentleman. *Improvements in the manufacture of carpets.* Application dated November 25, 1854. (No. 2493.)

This invention consists in the first place in the application of the fabric about to be first described to printed or particoloured warps, and in the second place in the manufacture of the fabric described secondly. The first fabric is produced by dividing the "printed" surface-warp into two or more equal parts, which work each in a separate leaf of heddles: thus, if the printed surface-warp is divided into two parts No. 1 thread is inserted in No. 1 leaf of heddles; No. 2 thread in the second leaf; No. 3 in the first; No. 4 in the second; and so on over the whole breadth, each alternate thread being inserted in the same leaf of heddles. In the same manner, if the surface-warp is divided into three parts there must be three leaves of heddles, the first thread being inserted in No. 1 leaf; the second in No. 2; the third in No. 3; the fourth in No. 1; the fifth in No. 2; the sixth in No. 3; and so on, so that there must be just as many leaves of heddles to contain the surface-warp as there are parts into which it is divided. Having proceeded thus far, the first half, third, fourth, or whatever part the surface-warp is divided into, is kept raised, and all the other parts of it lowered; the wire is then inserted and the first part (which was kept raised) is taken down over it and fixed there by the weft-shots intersecting the binding chain. No. 2 part of the warp is then raised (all other parts being kept lowered) and undergoes the same process as the first part; and so on till all the different parts of the warp are gone over, when the first part is again proceeded with as before. The production of the second fabric is effected in the same manner as regards the dividing of the warp, but differs in the weaving process.

LEVEY, CHARLES, of Red Lion-street, Holborn. *Improvements in weaving bags and tubular fabrics.* Application dated November 27, 1854. (No. 2500.)

This invention consists in simultaneously working two shuttles when weaving bags and other tubular fabrics. For this purpose the loom is constructed and the harness arranged in such manner as to open two sheds in the two warps at the same time, and the two shuttles are simultaneously thrown through the two sheds so opened, &c.

CROFTS, JOHN, of Birmingham, Warwick, manufacturer, and WILLIAM CARTWRIGHT, of Birmingham, manufacturer. *A new or improved cannon and projectile.* Application dated November 27, 1854. (No. 2501.)

This improved cannon is rifled, and the projectile consists of an iron ball the surface of which is covered with lead or other soft metal or alloy which, on the discharge, engages in the rifle of the barrel and communicates a rotary motion to the projectile. In the position usually occupied by the touch-hole the cannon has a longitudinal opening into the bore, through which the cartridge is dropped in. The breech-piece is then screwed forward, and the cartridge is thus forced into the bore, and the bore closed. The cartridge is exploded by means of a needle passing through the breech.

STAUNTON, THOMAS, of Vineyards, Bath, Somerset, gentleman. *Improvements in obtaining motive power.* (A communication.) Application dated November 28, 1854. (No. 2504.)

In carrying out this invention air is compressed by being passed through several compressing cylinders fitted with pistons, whence it finally passes into a reservoir from which it is taken as required.

TAVERNIER, JOHN, of Paris, France, confectioner. *A new edible compound.* Application dated November 29, 1854. (No. 2507.)

"I take by preference," says the inventor, "about two-thirds of wheaten flour, and about one-third of sugar, manna, or honey, or of a mixture of these three saccharine matters together. I add sufficient water to form a paste, and flavour it or not, as may be desired, with orange flower water or other essence or flavouring material, and then bake the paste in an oven until it becomes hard and assumes the colour of ship-biscuit, so that it may readily be reduced to a powder, into which state I reduce it by rasping, pounding, or other suitable means. I then take cacao, and bruise and pound it by any of the means ordinarily employed, and add thereto while being ground the farinaceous saccharine powder first described, in the proportion of five parts of powder to four parts cacao; but the proportion may vary according to the taste of the

consumer. The composition may be then formed into cakes or loaves, or into powder."

KEALY, JOHN, of Oxford-street, Middlesex, agricultural implement maker. *Improved machinery for cutting up turnips and other roots.* Application dated November 29, 1854. (No. 2511.)

In this improved machine a disc-wheel carrying knives is placed before the orifice of the shute; the pieces as they fall are conducted into a masher, which consists of a conical case open at both ends and fitted with a conical core, the periphery of which is formed of steel plates, and the cutting edges of which are produced by knocking up from the back, rows of pointed teeth, the spaces of one row being opposite the teeth of the next adjoining.

PROVISIONAL PROTECTIONS.

Dated May 22, 1855.

1152. John Cruickshank, of Marcassie, Elgin, North Britain, farmer. An improved construction of offensive and defensive equipment for cavalry.

1154. Homer Holland, of Westfield, Massachusetts, United States of America, physician. Improvements in the method of treating metalliferous sulphurets.

1156. Joseph Morgan, of Manchester, manufacturer of plaited wicks. An improvement in the manufacture of plaited or platted wicks used in the making of candles.

Dated May 23, 1855.

1160. Francis Leeshing, of Busby, near Glasgow, Lanarkshire, chemist. An improved method of preparing or treating certain dye-stuffs, so as to obtain greater dyeing power.

1162. Thomas M'Low, of Staples Inn-buildings, Holborn, London. Certain improvements in paddle-wheels.

1164. William Smith, of Salisbury-street, Adelphi, Middlesex. Improvements in safety apparatus for mine shafts and other hoists. A communication from M. Nicholas Joseph Jacquet, of Arras, France.

Dated May 24, 1855.

1166. William Smith, of Snow-hill, London, and Nathaniel Fortescue Taylor, of Gloucester-terrace, Park-wall, Chelsea, gas engineers. Improvements in meters for measuring gas and other fluids.

1168. Auguste Frédéric Godfrid Seegers, leather printer, of Paris, France. Improvements in the manufacture of hangings of paper and of textile fabrics.

1170. James Park, of Bury, Lancaster, engineer. Improvements in machinery for manufacturing paper pulp.

1172. Charles Rawlings, of Sherborne, Dorset. Improvements in writing desks.

1176. Oliver Rice Chase, of Boston, United States of America. A machine for making confectioner's "pipe," and for other purposes.

1178. Thomas M'Low, of Staples Inn-buildings, Holborn, London. Certain improvements in paddle-wheels.

1180. George Horrocks, of Pilkington, Lancaster, shuttle maker. Certain improvements in shuttles.

Dated May 25, 1855.

1182. Thomas Michael Greenhow, of Newcastle-upon-Tyne, Northumberland. Improvements in constructing and protecting the bottoms and sides of iron ships.

1184. Léon de Parienté, of Rue de Brabant, Faubourg de Schaerbeck, Brussels, Belgium. Improvements in cutting or sawing wood. A communication.

1186. Edward Aldridge, of Boston, Lincoln, manager of the Boston Waterworks. Improvements in meters for measuring the flow of liquids and fluids, which can also be employed for obtaining motive power, and in taps for regulating the flow of liquids.

1188. John Allen and William Allen, of Wallsend, near Newcastle-on-Tyne. An improvement in applying heat to alkaline solutions, and to drying and making alkaline salts.

Dated May 26, 1855.

1190. Robert William Waithman, of Bentham House, York, and Joseph Waithman, of Manchester, Lancaster. Improvements in machinery or apparatus for the manufacture of lint or similar substances.

1194. Robert Maclaren, of Glasgow, Lanark, engineer. Improvements in furnaces, and in the consumption or prevention of smoke.

1196. John Aspinall, of Fenchurch-street, London, civil engineer. Improvements in machinery for extracting moisture from substances, and for separating liquid from solid bodies, applicable to the refining of sugar, drying of goods, and to purposes for which centrifugal machines are employed.

1202. Théodore Marie Rabatté and Jacques Rettig, of Paris, France. Improved machinery for bruising, graining, or currying leather, skins, and hides.

1204. David Methven, of Pembroke-cottages, Caledonian-road, Islington. Improvements in the manufacture of stoppers for bottles and other vessels.

1206. François Théodore Botta, brewer, of Paris, France. A new construction of furnaces, called mixed furnaces, participating of the heating by the solid fuel, and by the combustion of the gaseous products.

1208. Auguste Edouard Loradoux Bellford, of Essex-street, Middlesex. Improved machinery to be used in preparing flax, hemp, and other fibrous matters. A communication.

Dated May 28, 1855.

1210. Samuel Rowlands, of Birmingham, Warwick, saddler. A new or improved instrument or apparatus to be used for purifying or otherwise treating gas. A communication.

1216. Frédéric De Moriés, of Montmartre, near Paris, France. Improvements in obtaining motive power.

1220. Thomas Partridge Salt, of Birmingham, Warwick, surgical instrument-maker. Improvements in the construction of artificial legs.

Dated May 29, 1855.

1224. Jean Baptiste Acklin, practical engineer, of Paris, France. Improvements in the mode of substituting paper to pasteboards in Jacquard looms.

1226. Edward John Payne, of Birmingham, Warwick. Improvements in the manufacture of covered thread. A communication from Christophe Emile Dumonteil, of Paris.

1228. William Langshaw, of Eagley, near Bolton, Lancaster, and George and William Jelley, of Leicester. Improvements in machinery for manufacturing fancy fabrics with both sides alike.

1230. George Rogers, of Alfred-place West, Brompton, Middlesex. Improvements in apparatus for retaining and drawing off aerated liquors. A communication.

1232. John Henry Johnson, of Lincoln's-inn-

fields, Middlesex, gentleman. Improvements in casting metals. A communication from Jackson Brothers, Petin Gaudet and Company, of Rive de Gier, France, engineers.

1234. Thomas M'Low, of Staples Inn-buildings, Holborn, London. Improvements in screw-propellers.

Dated May 30, 1855.

1236. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. An improved calculating apparatus.

NOTICE OF APPLICATION FOR LEAVE TO ENTER DISCLAIMER.

A petition has been presented to the Attorney-General for leave to enter a disclaimer to part of the title and specification of a patent granted to William Leigh Brook, of Meltham Mills, near Huddersfield, York, cotton-spinner, and Charles Brook, jun., of the same place, cotton-spinner. For "certain improvements in preparing, dressing, finishing, and winding cotton and linen yarns or threads." Dated November 25, 1853.

NOTICES OF INTENTION TO PROCEED.

(*From the "London Gazette," June 12th,* 1855.)

253. Frederick Samson Thomas and William Evans Tilley. Improvements in plating or coating metals.

269. Ebenezer Hartnall. Improvements in preserving animal and vegetable substances for food.

270. John Imray. Improvements in measuring instruments.

272. Pierre Joseph Carré. Improvements in ornamenting fabrics with metal leaf.

278. Frederick Gray. An improvement or improvements in candlesticks.

281. Peter Smith. Improvements in machinery or apparatus for printing textile fabrics and other surfaces.

286. William Warbrick and John Walker. Certain improvements in machines for preparing, spinning, doubling, warping, and dressing cotton, wool, and other fibrous substances.

288. George Tomlinson Bousfield. Improvements in steam ploughing-machines. A communication from Obed Hussey.

289. Edward Davies. An improvement in the manufacture of an oil and paraffin from a material not hitherto used for such purposes.

296. William Hartfield. Making book-covers in tortoiseshell, inlaid or not with pearl or ivory, and for improvements in machinery for embossing, carving, and inlaying book-covers with pearl and ivory, and for making metal joints, by which such books may be widely opened, the said improvements to be applicable to inlaying pianofortes.

322. John Ramsbottom. Improvements in the construction of certain metallic pistons.

378. Benjamin Goodfellow. Improvements in machinery for pumping, which improvements are applicable to the air-pumps of steam-engines and to other purposes.

445. Henry Constantine Jennings. An improvement in the manufacture of soap.

450. Richard Archibald Brooman. An improvement in rollers used in spinning. A communication.

487. Richard Archibald Brooman. Improvements in projectiles. A communication.

492. James Wood. Improvements in ornamenting woven fabrics for bookbinders and others.

517. Alfred Krupp. Certain improvements in the construction of railway-wheels.

618. William Smith. Improvements in ploughing or trenching and subsoiling land.

963. James Marsh. Improvements in the construction of pianofortes for rendering them more portable.

964. Robert Burns. Improvements in propelling vessels.

1088. Thomas Charles Eastwood and Thomas Whitley. Improvements in preparing and combing wool and other fibrous substances.

1091. Robert Stirling Newall. Improvements in apparatus employed in laying down submarine electric telegraph wires.

1160. Francis Leeshing. An improved method of preparing or treating certain dye-stuffs, so as to obtain greater dyeing power.

1177. Theodor Baron von Gilgenheimb. A new machine for tilling land.

1190. Robert William Walthman and Joseph Walthman. Improvements in machinery or apparatus for the manufacture of lint or similar substances.

1236. Alfred Vincent Newton. An improved calculating apparatus. A communication.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed June 8, 1855.

2607. William Bemrose the younger, and Henry Howe Bemrose.
2612. George Henry Bachhoffner.
2640. William Clark.

1855.

736. William Lund and William Edward Hipkins.

Sealed June 12, 1855.

2613. Timothy White.
2621. John Louis Jullion.
2635. William Charles Scott.
2637. Louis Cornides.
2644. Francis Archer and William Papineau.
2657. Juliana Martin.
2662. William Hartley.
2669. James Pritchard.
2674. Frederick Robert Augustus Glover.
2691. George Bell and George Charles Grimes.
2692. William Bertram.
2715. George Anderson.
2721. Charles Edward White and Francis Robinson.
2729. John Lang Dunn.
2731. John Cornstock.
2753. Henry Richardson Fanshawe and John Americus Fanshawe.
2756. Eugene Mayeur.
2762. John Henry Johnson.

1855.

5. Stephen Giles.
8. Henri Louis Dormoy.
39. John Scott.
74. Robert Oxland.
110. Henry Adkins.
153. Matthew Bolton Rennie.
179. James Webster.
218. John Imray.
238. Jacques Roux Dalguey-Malavas.
244. Thomas Ogden Dixon.
396. William Hartcliffe and Joseph Waterhouse.
400. John Norton.
711. Manning Prentice and Thomas Richardson.
713. Manning Prentice and Thomas Richardson.
718. Charles Whitley.
733. Robert Stirling Newall.
739. Henry Chapman.
761. Charles Goodyear.
765. Herbert Mountford Holmes.
766. Peter Arrive.
801. Samuel Holt.
803. Philippe Amédée Devy.
813. Alexander Cunningham.
842. Robert Milligan.
844. Charles Crapelet.
874. John Atherton and William Lancaster.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Mason and Co., *Dublin*; W. C. Campbell and Co., Hamburg.

Mechanics' Magazine.

No. 1663.] SATURDAY, JUNE 23, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

HARMAN'S PATENT WINDLASSES, CAPSTANS, ETC.

Fig. 1.

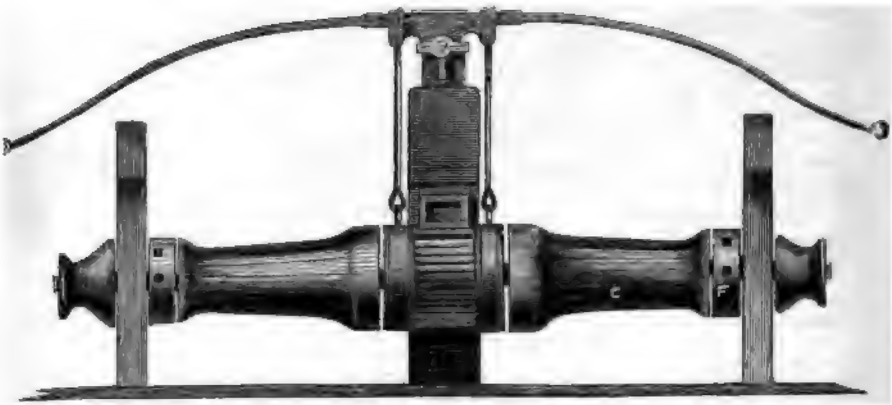


Fig. 2.

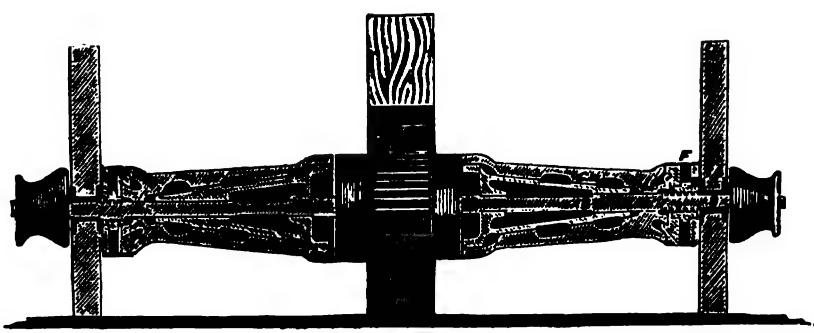


Fig. 3.

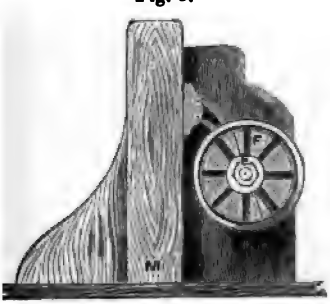
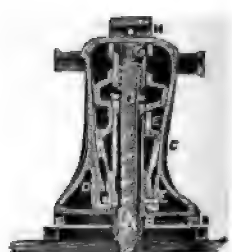


Fig. 4.

Fig. 5.



HARMAN'S PATENT WINDLASSES, CAPSTANS, ETC.

MR. H. W. HARMAN, of the Dockyard, Northfleet, whose improvements in steam engines were described at page 505 of our 61st volume (No. 1633), patented on the 9th of November last an invention the object of which is to supply a more safe and convenient means than those at present employed for regulating or arresting the motion of ships' anchors and other heavy bodies attached to windlasses, capstans, crabs, cranes, and other machines for raising, lowering, or moving heavy bodies. For this purpose, he constructs the windlass, capstan, or other machine with a barrel, upon which the cable is to be wound, and with certain other apparatus connecting the barrel with the pauls and gear, which may be of the usual construction. The barrel is so made as to be capable of revolving with the cable or rope independently of the spindle and gear, and without raising the pauls, so as to allow the cable or rope to run freely out; or it may be so brought in contact with a certain conical surface as to produce friction, which will retard or govern its speed, so as to check the run of the cable or rope, or it may be so clamped or fixed to the spindle and gear as to revolve with them, and to twist, wind up, or tighten the cable or rope. The means by which he brings the barrel into close contact with the conical surface is of two kinds: the first is employed when the spindle of the windlass, capstan, or machine is supported by bearings on both sides of the barrel, and the second when it is supported at one side of the barrel only.

Fig. 1 of the engravings on the preceding page is an elevation of a windlass seen from the ship's bows, with these improvements applied to it; fig. 2 is a longitudinal section of such parts of the same as lie between the supports or bearings of the spindle; and fig. 3 a transverse section through the metal nut for moving the barrel. The windlass is supposed to consist of two parts to the right and left of the centre post and bearing, M, and as the construction of both of these is similar, it will only be needful to describe that to the right of M. B, fig. 2, is the spindle, upon which is securely fixed the inner barrel, A, of a conical shape, and made of iron or wood, according to the strength required. C is the outside barrel upon which the cable is wound; the inside of this barrel is conical, and corresponds with the outside of the barrel, A. The barrel, C, when not pressed against A, is free to turn either way, and the cable wound upon it would then be free to run out without any motion of the spindle or inner barrel, A, or other gear. The spindle between B and D, is screwed so as to receive the metal nut, E, enclosed in the iron clutch, F, which is made in two pieces, so as to let that part of it which is towards C take into the bevilled collar, G. The pieces are clamped together by a ring enclosing them, and are pierced with holes to admit bars, by which the clutch, F, and with it the nut, E, may be moved round upon the spindle, B, and thus caused to move the barrel, C, by means of the collar, G, to one side or other along the spindle. When it is desired to hoist or wind up the cable on the barrel, C, the clutch, F, is turned, so as to move the barrel, C, towards M, until the conical surfaces of the barrels, A and C, are so pressed together that the force applied to the spindle, B, by the ordinary windlass bars or other machinery, shall not overcome the friction between the two barrels. In this state the barrel, C, will move with, and as if it were a part of, the barrel, A. When it is desired to slack off or let go the cable on the barrel, C, without lifting the pauls or turning the spindle or other gear of the barrel, A, the clutch, F, is moved round, so as to withdraw the barrel, C, from the position of close contact with the barrel, A, until the tension of the cable overcomes the friction between the barrels, and the barrel, C, will move round the barrel, A, more or less freely as the nut, E, is moved more or less from A. If it be desired to let the cable run freely, the nut, E, is turned until the clutch, F, acting on the collar, C, withdraws the barrel, C, from pressing on A towards M, and the barrel, C, will then turn freely round A, and the cable run out as desired.

Fig. 4 is an elevation, and fig. 5 a vertical section, of a capstan, with the improvements applied to it. A is the spindle, which is fixed as usual, and does not revolve. B, B is the paul plate, consisting of a circular part at the lower end of the capstan, carrying the pauls, and a cylindrical part embracing the spindle near E, E, and turning upon it. C, C, the barrel on which the cable is wound. The interior is of conical shape, as shown in fig. 5, and corresponds with the exterior of the conical barrel, D, D, E, E, which is inserted between the paul piece at E and the outer barrel, C. The barrel, C, is furnished at the top with holes for capstan bars, or with other means for applying power. The inner conical barrel slides vertically up and down that part of the paul piece shown at E, which is made cylindrical for that purpose; but the barrel cannot turn upon the paul piece, being compelled to move about the spindle with the paul piece by a feathered rib, placed longitudinally in the direction of the spindle, and fitting and moving in a corresponding groove cut in the interior cylindrical part of the conical barrel. This conical barrel, D, is made in

two similar halves, so as to enable the upper part, M, M, to be passed over and embrace the clutch, G, which is screwed to receive the upper part of the spindle. To the upper part of the clutch, G, is fixed the top-piece, H, furnished with holes to receive bars, or other suitable contrivances for turning it round. This top-piece turns on and bears upon upper part of the outside barrel, but it is free to move independently.

It putting the various parts of this capstan together, the paul-piece, B, must first be put upon the spindle, then a nut, N, screwed down to bear slightly upon the upper part of the paul-piece, to prevent the capstan from rising or sliding off the spindle. The outer barrel is then put on, and a piece, K, is screwed into a suitable receptacle in the barrel, C, and projects into a corresponding groove in the paul-piece, so as to prevent the outer barrel from rising out of its proper position. The two halves of the inner barrel are made to embrace the clutch, G, and screwed together by bolts, shown at E, E, and the barrel may then be lowered into its place until the top of the spindle reaches the clutch, when the top-piece, H, is to be turned, and the inner barrel will descend, until its outer conical surface comes in contact with the inner conical surface of the barrel, C. When it is desired to use the capstan for winding up or hoisting the cable wound upon the barrel, C, the top-piece, H, must be turned until the friction between the barrels, C and D, is sufficient to cause them to move together, and the whole capstan moves round the spindle, bringing into action the pauls and other gear. When it is desired to slack out the cable without lifting the pauls, the capstan bars may be removed, and the top-piece, H, turned, and the nut moved upwards on A, so as to withdraw the clutch, and with it the conical inside barrel, until the tension of the cable overcomes the friction between the barrels, when the outer barrel, C, will rotate about the inner one, and slack off the cable at a rate which can be regulated by the amount of friction caused between the barrels. When it is desired to let the cable run freely, the top-piece, H, will be turned until the conical bar is so far withdrawn from the outside barrel, C, as that the friction between them is no obstacle to the free rotation of the outer barrel.

ON NATURE-PRINTING.

The art of nature-printing is a method of producing impressions of plants and other natural objects in a manner so truthful that only a close inspection reveals the fact of their being copies. So distinctly sensible to the touch are the impressions, that it is difficult to persuade those unacquainted with the manipulation that they are the production of the printing-press. The process, in its application to the reproduction of botanical subjects, represents the size, form, and colour of the plant, and all its most minute details, even to the smallest fibre of the roots. We have been for some time anxious to bring a comprehensive and reliable account of this beautiful art before our readers, and are now enabled to do so by publishing the following paper, which comprises the substance of an admirable lecture recently delivered at the Royal Institution by H. Bradbury, Esq., M.R.I., one of the patentees of a great improvement in the art in this country.

The distinguishing feature of the process, compared with other modes of producing engraved surfaces for printing purposes, consists, firstly, in impressing natural objects—such as plants, mosses, seaweeds, feathers, and embroideries—into plates of metal, causing, as it were, the objects to engrave themselves by pressure; and secondly, in being able to take such casts or copies of the impressed plates as can be printed from at the ordinary copper-plate press.

This secures, on the one hand, a perfect representation of the characteristic outline of the plant, as well as that of some of the other external marks by which a plant is known, and even in some measure its structure; as, for instance, in the venation of ferns, and the leaves of flowering plants; and, on the other, affords the means of multiplying copies in a quick and easy manner, at a trifling expense compared to the result obtained, and to an unlimited extent.

The great defect of all pictorial representations of botanical figures has consisted in the inability of art to represent faithfully those minute peculiarities by which natural objects are often best distinguished. Nature-printing has therefore come to the aid of this branch of science in particular, whilst its future development promises facilities for copying other objects of nature, the reproduction of which is not within the province of the human hand to execute; and even were it possible, it would involve an amount of labour scarcely adequate to the results obtained.

Although considered for some years past in various parts of Europe as a new art, the idea is by no means so recent as is supposed; much less is there ground for the Austrians to assert their exclusive right to the priority of the invention merely on

account of the first application of the process in its fullest extent in the Imperial Printing-office at Vienna.

Councillor Auer* has not only done this, but he has claimed for nature-printing a position to which it has no right: he has compared it to the invention of writing and the art of printing; moreover, he has placed it on an equality with the galvanoplastics of Jacobi and Spencer, and the daguerreotype of Daguerre. Valuable as are the results of nature-printing, it still has its defects; it has its limits, and its applications are limited, and care will be required to confine it within the bounds of its capabilities.

That an establishment so renowned for its productions as that at Vienna, unlimited in its command of the resources of science and mechanism, should have been the first to bring any invention connected with printing to a practical state of perfection is not matter to create surprise; but that it should, in the most unqualified manner, in the name and on the authority of its chief director, claim all the honour of the discovery, is a point that is open to question, and in point of fact is questioned by several private individuals, who, for want of those unlimited resources and opportunities which only government establishments are able to command, were unable to crown their experiments with practical results.

Nature-printing is nothing more than an application of facts worked out by various persons, in different countries, under very different circumstances, and at very different periods; and by tracing out its history, and detailing the earlier experiments connected with it, Mr. Bradbury hoped to show that he did not put forward personally any claim either to its origin or to its first application; but that he spoke as one who, having perceived its value, was desirous to render it an available auxiliary to the printing-press.

Nature herself, in her mysterious operations, seems to have given the first hint upon the subject: witness the impressions of Ferns so beautifully and accurately to be seen in the coal-formations.

Experiments to print direct from nature were made as far back as about two hundred and fifty years—it is certain that the present success of the art is mainly attributable to the general advance of science, and the perfection to which it has been brought in particular instances.

On account of the great expense attending the production of woodcuts of plants in early times, many naturalists suggested the possibility of making direct use of nature herself as a copyist. In the *Book of Art*, of Alexis Pedemontanus (printed in the year 1572), and translated into German by Wecker, may be found the *first* recorded hint as to taking impressions of plants.

At a later period—in the *Journal des Voyages*, by M. de Moncoys, in 1650, it is mentioned that one Welkenstein, a Dane, gave instruction in making impressions of plants.

The process adopted to produce impressions of plants at this period, consisted in laying out flat and drying* the plants. By holding them over the smoke of a candle, or an oil lamp, they became blackened in an equal manner all over; and by being placed between two soft leaves of paper, and by being rubbed down with a smoothing-bone, the soot was imparted to the paper, and the impression of the veins and fibres was so transferred.

Linnæus, in his *Philosophia Botanica*, relates that in America, in 1707, one Hessel made impressions of plants; and between 1728 and 1757, Professor Kniphof, at Erfurt, who refers to the experiments of Hessel, in conjunction with the bookseller Funke, established a printing-office for the purpose. He produced a work entitled *Herbarium Vivum*. The range and extent of his work, twelve folio volumes, and containing 1200 plates, corroborates the curious fact of a printing-office being required. These impressions were obtained in a manner very similar, but with the substitution of printer's ink for lamp-black, and flat pressure for the smoothing-bone. A new feature at this time was introduced—that of colouring the impressions by hand, according to Nature—a proceeding which though certainly contributing to the beauty and fidelity of the effect, yet had the disadvantage of frequently rendering indistinct, and even sometimes totally obliterating, the tender structure and finer veins and fibres. Many persons at the time objected to the indistinctness of such representations and the absence of the parts of fructification; but it was the decided opinion of Linnæus, that to obtain a fac-simile of the difference of species was sufficient.

Seligmann, an engraver at Nuremberg, in 1748 published in folio plates figures of several leaves he had reduced to skeletons. As he thought it impossible to make drawings sufficiently correct, he took impressions from the leaves in red ink, but no

* Vide "Denkschriften der Kais. Akademie, Wien; Math.-Nat. Classe." Band v., p. 107 (illustrated by many plates).

* Although the plants were dried in every case, Mr. Bradbury stated, that it was by no means absolutely necessary, as he proved by the simple experiment of applying lamp-black or printer's ink to a fresh leaf, and producing a successful impression.

mention is made of the means he adopted. Of the greater part he gave two figures, one of the upper and another of the lower side.

Even at this early period the idea must have excited much attention; for it is recorded that Seligmann had announced his intention to give figures of natural objects as magnified by a solar microscope, and that two were to have been published every month. But he died soon after, and a law-suit prevented the prosecution of his work. Two black and twenty-nine red plates of leaves had been already completed, and were published with eight pages of text, in which his coadjutor, Crew, speaks of the physiology of plants, and Seligmann of the preparation of leaf skeletons. The leaves represented on the plates were those of the orange, lemon, shaddock, &c.

In the year 1763 the process is again referred to in the *Gazette Salutaire*, in a short article upon a *Recette pour copier toutes sortes de plantes sur papier*.

About from twenty-five to thirty years later, Hoppe edited his *Ectypa Plantarum Ratisbonensium*, and also his *Ectypa Plantarum Selectarum*, the illustrations in which were produced in a manner similar to that employed by Kniphof. These impressions were found also to be durable, but still were defective. The production of impressions could only take place very slowly, as the blacking of the plants with the printer's ball required much time. Rude as the process was, and imperfect the result, it was nevertheless found that the figures thus produced were far more characteristic than any which artists could produce. The fault of the method consisted in its limited application and in its incompleteness. Since the fragile nature of the prepared plant, if ever so carefully treated, would admit of but very few copies being taken, and where any great number would have been required, many plants must have been prepared, a circumstance which was in itself a great obstacle.

In the year 1809 mention is made in Pritzell's "Thesaurus" of a *New Method of taking Natural Impressions of Plants*; and lastly, in reference to the earlier history of the subject, the attention of scientific men was called to an article, in a work published by Grazer, in 1814, on a *New Impression of Plants*.

Twenty years afterwards, the subject had undergone remarkable change, not only in the mode of operation to be pursued, but also in the result produced,—which consisted in fixing an impression of the prepared plant in a plate of metal by pressure.

It appears, on the authority of Professor Thiele, that Peter Kyhl, a Danish goldsmith and engraver, established at Copenhagen, applied himself for a length of time to the ornamentation of articles in silver ware, and the means he adopted were, taking copies of flat objects of nature and art in plates of metal by means of two steel rollers.

Various productions in silver of this process were exposed in the Exhibition of Industry held at Charlottenburgh, in May, 1833. In a manuscript, written by this Danish goldsmith, entitled *The Description (with forty-six plates) of the Method to Copy Flat Objects of Nature and Art*, dated 1st May, 1833, is suggested the idea of applying this invention to the advancement of science in general. The plates accompanying this description represented printed copies of leaves, of linen and woven stuffs, of laces, of feathers of birds, scales of fishes, and even of serpent-skins.

The manuscript contains ample and clear instructions to carry out the method, and a few extracts, in his own words, of the leading features will be, perhaps, interesting. He thus writes:—

"As a correct copy of the productions of nature and art must be of great importance, I am delighted to have the honour of submitting to the friends of art and science a method I have discovered, by which copies of most objects can be taken, impressed into metal plates, and which enables the naturalist and botanist to get representations of leaves, feathers, scales, &c., in a quick and easy way; and these copies will give all the natural lineaments, with their most raised or sunken veins and fibres; moreover, the artist can, by means of this invention, make use of Nature's real peculiarities for ornamental compositions and productions; and the merchant can get patterns of delicately woven or figured stuffs, laces, tickens, ribbon, linen, and so forth.

"To fix an impression into a plate of copper, zinc, tin, or lead, properly prepared for the purpose, a rolling machine with two polished cylinders of steel is required; if a *leaf*, quite dried and prepared, is placed between a polished steel plate half an inch thick and a thoroughly heated lead plate with a fine surface, and these two plates with the leaf between be run speedily between the cylinders, the leaf will by the pressure yield its form on the softer lead plate, precisely as it is shaped, with all its natural raised and sunken parts.

"I tried many ways to fix the leaf on the plate by some glutinous matter, but it filled the delicate pores and deep parts so much as to render the copies very indistinct.*

"The printing itself of the leaf into the metal requires much precaution, especially

* Mr. Bradbury stated that he had himself tried this method without success.

with respect to placing the cylinders exactly parallel, and at the same time at a proper distance, and to have the plate to be stamped carefully burnished and polished; besides, the utmost care must be used, as particles of dust or dirt would be printed together with the object itself. Moreover, care must be taken that the rolling of the plates is managed well, so as to run parallel, without deviating from their first direction.

"Leaves that are to be printed must first be spread upon a clean sheet of paper and placed upon a warm oven; a second sheet put over them is to be strewn with sand, and the whole left to dry under a weight. This done, the leaves are taken out with due precaution, and placed for a quarter of an hour into water. They are dried again in the same way, and this manipulation is repeated four or five times. By this means I always found that the leaves gained in tenacity and firmness, that they lost all their moisture, and became more fit to be stamped. Objects, such as laces, weavings, figured ribbons, and such like, can be printed without any preparation, provided they be spread flat between the plates.

"The season being very unfavourable for gathering good strong leaves, I had to overcome many difficulties, so that the copies are not so good as they might have been—for I have observed that leaves obtained from green-houses do not yield such distinct prints as those that grow in the open air, when properly developed."*

It would appear from the practical hints here given, that Peter Kyhl was no novice at the process. He distinctly points out what he conceives to be its value, by the subjects that he tried to copy; and he enters into detail on the precautions to be observed in the operation of impressing metal plates so as to insure successful impressions. His manuscript explains that he had experimented with copper, zinc, tin, and lead plates. Still there existed obstacles which prevented him from making a practical application of his invention. In the case of zinc, tin, and copper, the plant, from the extreme hardness of the metals, was too much distorted and crushed; while in lead, though the impression was as perfect as could be, there was no means of printing many copies, as it was not possible after the application of printer's ink to retain the polished surface that had been imparted to the lead plate, or to cleanse it so thoroughly as to allow the printer to take impressions free from dirty stains. This was a serious obstacle, which was not compensated for, even by the peculiar rich surface of the parts that were impressed, attributable to the lead being more granular than copper, and which is so favourable to adding density or body of colour, without obliterating the tender veins and fibres. Peter Kyhl died in the same year that he made known his invention. At his death, his manuscripts and drawings were deposited in the archives of the Imperial Academy of Copenhagen, where they remained for upwards of twenty years: and it is a remarkable fact, that, shortly after his death, was discovered the only thing wanting to render the process, as explained by him, at once available for practical purposes. Had Kyhl lived to prosecute his experiments, he might have accomplished more than he did without requiring the aid of other means.* It was he who discovered how to take impressions in metal plates, by using steel-rollers.

This is the first element in the process of Nature-printing. It fell to Dr. Ferguson Branson, of Sheffield, to suggest the second and the most important.

(To be continued.)

* This allusion to the want of tenacity and firmness in young, and especially in green-house plants, is quite consistent with the experiment made at the present time. Mr. Bradbury stated, that to obtain an impression at all, upon a plate of metal, of a plant, it was indispensable that the plant should be thoroughly dried and free from sap; otherwise the plant would spread in all directions, without leaving any visible indentation. Objects such as lace, and figured fabrics, can be impressed without any preparation, provided they ***be spread flat*** between the plates.

* Kyhl, as it was, had had his attention directed, and had made experiments to overcome this one remaining difficulty. His manuscript also contains many interesting and practical remarks upon other processes than simply Nature-Printing.

NOTÆ MATHEMATICÆ.

(By T. T. Wilkinson, F.R.A.S., Member of th Manchester Philosophical Society, of the Historic Society of Lancashire and Cheshire, &c.)

NO. VII.

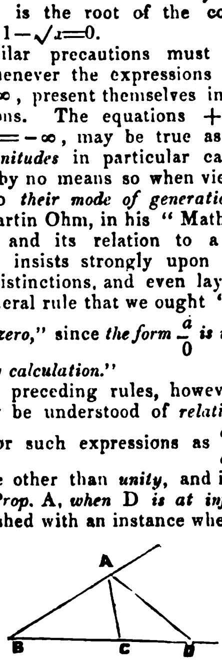
(Continued from page 275.)

THE subject of Impossible Equations appears to be daily growing in interest. Mr. Cockle's paper on "Incongruous Solutions," printed in a late number, contains a series of references to papers on this somewhat novel portion of algebraical investigation, from which we may gather its leading principles, and not a few of its most striking characteristics. Particular circumstances having at different times diverted my thoughts in this direction, I now beg, in deference to the advice of a valued friend, to offer the following to the consideration of the readers of this Magazine. Should the notes contain nothing *new*, they may perhaps, have the merit of placing one or two *old* truths in a new light.

NOTE 1. In all researches relating to such equations we must carefully guard against introducing ambiguities into the *derived* equations. When this precaution is neglected we are sometimes liable to overlook a *vigorous* symbolical solution of an otherwise Impossible Equation. Thus, if it were required to find the roots of the equation $1+\sqrt{x}=0$, we have $+\sqrt{x}=-1$, and consequently $x=(-1)^2$. This value of x evidently *verifies* the original equation, for $+\sqrt{x}=(-1)$, and $1+(-1)=1-1=0$; —but if we had lost sight of the mode in which the value of x is generated, by writing the *derived* equation thus, $x=1$, an ambiguity would have been introduced and verification would be necessary to prove that $+1$ is the root of the congeneric equation $1-\sqrt{x}=0$.

2. Similar precautions must also be taken whenever the expressions $+0$, -0, $+\infty$, $-\infty$, present themselves in our investigations. The equations $+0=-0$; and $+\infty=-\infty$, may be true as to absolute *magnitudes* in particular cases; but they are by no means so when viewed with regard to *their mode of generation.* Professor Martin Ohm, in his "Mathematical Analysis and its relation to a Logical System," insists strongly upon such necessary distinctions, and even lays it down as a general rule that we ought "*never to divide by zero,*" since *the form* $\frac{a}{0}$ *is inadmissible in any calculation.*"

3. The preceding rules, however, must obviously be understood of *relative* values only;—for such expressions as $\frac{a-a}{a-a}=\frac{0}{0}$, cannot be other than *unity*, and in *Euclid*, B. VI., *Prop.* A, *when* D *is at infinity*, we are furnished with an instance where



$$\frac{AB}{AC}=\frac{BD}{CD}=\frac{\infty}{\infty}=1\,;$$

—since the triangle ABC is then known from other principles to be isosceles.

4. The subject of Impossible Equations does not appear to have escaped the observation of the continental mathematicians; for the January number of the *Nouvelles Annales de Mathematiques*, for 1844, contains a request that the equation

$$+\sqrt{1+x}+\sqrt{1-x}=1$$

should be resolved and discussed. After proposing the question, M. Terquem remarks:—"When we free a given equation from radicals the rational equation thus obtained contains *all* the roots, not only of the equation proposed, but also of all the irrational equations which it is possible to form by taking each radical with all its variations of algebraical sign. By operating in this manner with the equation $+\sqrt{1+x}+\sqrt{1-x}=1$, we derive the equation $x^2=\frac{3}{4}$; of which the roots are $\pm\frac{1}{2}\sqrt{3}$. Neither of these two values, however, satisfy the proposed equation, for it does not admit of any real root. This is what we propose for explanation."

5. Nearly two years later the equation was solved by M. Gilain, of Brussels, in tome iv., pp. 520, 524, of the same work, by showing that it did not admit of any roots either real or imaginary. "This conclusion," he remarks, "may astonish certain individuals, for we generally believe that all algebraical equations have at least one root either real or imaginary; but this is one error which it is of importance to eradicate."

6. In a subsequent portion of his communication, M. Gilain observes, that we "ought to distinguish carefully between a *mathematical* and a *hypothetical* absurdity in the enunciation of a problem. The equation $x^2=-a$ indicates merely an absurdity in the *hypothesis;* whilst $+\sqrt{x}=-a$ denotes in addition a mathematical absurdity, since no algebraical value substituted for x is able to satisfy this equation." A reference to (1) will show that the symbolical solution $x=(-a)^2$ has here been overlooked; which is the more to be remarked since he afterwards asserts that "the solution $x-(-a)^2=a^2$ is only applicable to the equation $-\sqrt{x}=-a$."

7. M. Terquem, however, disputes the correctness of M. Gilain's conclusions, and affirms that the whole of his discussion "turns upon a misunderstanding." He argues the incorrectness of the details upon the ground that "the sign $+$ represents an *addition*, but not always an *augmentation*," nor is "algebraical *subtraction* synonymous with *diminution.* When the term $+x$ is met with in an equation we know not beforehand whether this $+x$ will produce an *augmentation* or a *diminution*, so long as x is positive or negative; but if we make it an imperative condition that this term shall produce an augmentation, the question may become *impossible*, although that impossibility may not be represented by an imaginary symbol. If, for example, we are given $2+x=1$, we are assured by Algebra that $x=-1$; but if we maintain that x shall be positive, and that $+x$ shall produce an augmentation, we meet with a logical impossibility, for 2 cannot be *augmented* so as to become 1. It is the same in the equation $\sqrt{1+x}+\sqrt{1-x}=1$.

Algebra assures us that $x = \pm \frac{1}{2}\sqrt{3}$; but if we insist that $+\sqrt{1-x}$ shall produce an *augmentation*, the question is impossible. When we abandon this algebraical restriction the question becomes impossible, for it corresponds to the equation $2+2\sqrt{1-x^2}=1$, and $2+2(-\frac{1}{2})=1$ is a *real* solution. *Thus every equation has a root either real or imaginary.*"

8. It would appear from the above that M. Terquem has not fully met the argument of M. Gilain; for he has obviously fallen into the common mistake of supposing that some of the roots of the *rational* equation must necessarily be *identical* with those of every *irrational* equation into which the former may be decomposed. As M. Gilain remarks, "an equation of any degree whatever does not possess all the properties of the equation of a superior degree of which it is a consequence," and hence "we require therefore always to be well assured, when we deduce the latter from the former, what are the properties of the *second* which belong also to the *first*."

9. We are obviously not at liberty to consider any given surd equation and its corresponding group of congeners as *simultaneous* equations; and hence it appears necessary for us to *restrict* the meaning of the symbols. When we have given any equation of the form $X-a=0$, the equation $mX-ma=0$ is *also* true; and if $a=0$, then $mX=0$ must also express a correct relation. Hence if $X=1+\sqrt{x}$, $a=0$, and $m=1-\sqrt{x}$; the equation $(1-\sqrt{x})(1+\sqrt{x})=0$ must hold good, whatever value be assigned to m. Consequently, when surd equations are cleared of fractions, by multiplying by one or more of their congeners, it does not follow that we must suppose these congeners severally $=0$.

10. This also follows from the consideration that if $(1+\sqrt{x})(1-\sqrt{x})=0$, when $1+\sqrt{x}=0$, *by hypothesis*, we have

$$1-\sqrt{x}=\frac{0}{0}$$

where the zeros are not *absolute* but *relative;* and consequently the left-hand side, or $1-\sqrt{x}$, may admit of every variation of value.

11. Hence we perceive the reasons why the rationalization of surd equations so frequently brings us little or no nearer the object of our search; for instead of solving the given equation *per se*, we are required to solve a *compound* equation formed from the product of the surd equation with one or more of its corresponding group of congeners, each factor of which *may* be equated to zero.

12. When we multiply the equation $\sqrt{x+1}+\sqrt{x-1}=0$, by either of its partial components $\sqrt{x+1}$ or $\sqrt{x-1}$, as is done by Mr. Tebay, we *virtually* assume, that because the former equation is equal to zero, the latter factors are also equal to the same quantity, which is by no means a *necessary* consequence. It is the same with the equation $\sqrt{x}+\sqrt{x+1}=0$; for when the exclusion of foreign factors is attended to we find in both cases $x=\pm\infty$, as I have before shown in a former number of this journal.

(*To be continued.*)

SOCIETY OF ARTS, MANUFACTURES AND COMMERCE.

The general meeting, to receive the report of the council of the above society, relative to the proceedings of the past year, and the auditors' statement of accounts, was held on Wednesday, the 13th instant, Viscount Ebrington, M.P., chairman of council, in the chair.

The council, in laying before the members the annual report of their proceedings, first referred to the educational exhibition, which, although commenced in the previous year, and due to the labours of the former council, actually took place since the presentation of the last report.

After alluding gratefully to the gentlemen who lectured at St. Martin's Hall, in connection with that exhibition, the report proceeded to express that it is to be regretted that no permanent and complete record of these lectures remains. Abstracts of nearly all were, however, published in the journal of the society; some few were published separately by their authors, and at the request of the council, the MSS. of others were furnished to Messrs. Routledge, who undertook their publication in a cheap form, and the volume * of the exhibition lectures thus published forms an interesting and valuable contribution to our educational literature.

After a general review of the papers read during the past session at the evening meetings of the society, the report goes on to say that the council feel that the meetings of the present session have been appreciated by the members, and it is, therefore, unnecessary, and would be a useless task on their part, to endeavour to impress upon the members that which is already acknowledged. They have great satisfaction in announcing that

* Lectures, in connection with the Educational Exhibition of the Society of Arts, Manufactures, and Commerce. London: G. Routledge and Co. Price 1s. 6d.

to the authors of five of the papers read during the present year, the society's silver medal has been awarded. These gentlemen are—Mr. Charles Atherton, Col. Arthur Cotton, Mr. J. B. Lawes, Mr. Charles Sanderson, and Mr. P. L. Simmonds. They have also determined that Dr. Forbes Royle's paper "On Indian Fibres fit for Textile Fabrics, or for Rope and Paper Making," read during the last session, should be similarly acknowledged.

The committee on industrial pathology has continued its labours, and its first report, "On Trades which affect the Eyes," has already been printed in the Journal.* The committee have this year undertaken to report on the injuries arising out of dusty trades, and are endeavouring to obtain such information on this division of their subject, as will render their report of practical value to those engaged in and suffering from such occupations.

The council, viewing the great benefit to arts and manufactures likely to arise from the artizans of this country visiting the Paris Exhibition, at the close of the last session called the attention of the members of the society and of the institutions in union to the subject, and suggested the formation of local clubs for raising, in weekly or monthly subscriptions, a fund to enable the workman to meet the expenses of such a visit. A committee of correspondence was appointed, in connection with this subject, to collect and publish in the Journal such information as might facilitate these excursions by the working men. An establishment for the reception and accommodation of the artizans has been started in Paris, mainly, it is believed, in consequence of attention having been called to the subject by the exertions and correspondence of the committee. Her Majesty's Government, too, has accorded the privilege of passports free of all charge to artizans purposing to visit Paris this summer. The details of these arrangements have already been given in the Journal, and the council have the satisfaction of stating that the correspondence with the institutions shows that clubs have been formed, and that many of the members of the institutions contemplate a visit to the Exposition Universelle.

The great value of an improved system of international commercial law was brought to the notice of the council by a number of the members of the society specially and practically conversant with the anomalies at present existing, and the impediment such anomalies present to the free course of commercial transactions. On a requisition by these members the council convened a special meeting of the society to discuss the question. The committee are now in correspondence with M. Achille Fould, Ministre d'Etat, urging on him the importance of taking advantage of the numerous distinguished persons who will visit Paris during this summer to hold a congress there for the discussion of this subject.

It is not inappropriate here, continues the report, to allude to the subject of limited liability in partnership—one in which the society has taken so warm an interest. The members will have seen with pleasure that Parliament has under its consideration bills brought in by Ministers of the Crown for amending the law in this respect.

The arrangement between the Royal Commissioners of the Great Exhibition of 1851 and the council in relation to the formation of a collection of raw and manufactured animal produce as the first step towards the establishment of a general "Trade Museum," expires in July next. The council congratulate the members on the valuable collection which has been got together, and which is now exhibited in the model room of the society, open to the inspection of the members and their friends. The collection is entirely due to the skill, zeal, and judgment of Professor Solly, to whom its formation was entrusted.

The premium list issued by the council at the commencement of the session was carefully revised, and subsequently a list of special prizes was published,* for two of which the society are indebted to the liberality of Benjamin Oliveira, Esq., M.P., who placed at the disposal of the council two prizes of £25 each, or a gold medal of equal value, for such subjects as the council should determine. These were offered—

"For two pounds of the best and finest flax thread, spun by machinery suitable for lace-making."

And the other—

"For the best Essay on the Means of Preventing the Nuisance of Smoke arising from fires and furnaces."

The awards for these two prizes are still under consideration.

Another of the special prizes—viz., £5, to which the society added its medal—

"For a Composition for the feeding rollers used in printing paper-hangings by cylinder machinery, similar in consistency and action to those used in letter-press printing, but adapted for working in water-colours,"

is due to Mr. S. M. Hubert.

The important position which the microscope now holds, not only in relation to pure but to applied science, and its great value in assisting to form those habits of

* See *Mech. Mag.* for Jan. 20, 1855, p. 56. (No. 1641.)

* See *Mech. Mag.* for Feb. 10, 1855, p. 130. (No. 1644.)

observation which it is the object of all sound education to impart, induced the council to believe that the promoting the production of a good instrument at a price which should render it more readily accessible to the many, was an object worthy of the society; and, accordingly, under the advice and with the assistance of a committee, composed of Mr. Busk, F.R.S.; Dr. Carpenter, F.R.S.; Mr. Jackson; Dr. Lankester, F.R.S.; Mr. Quekett; and Mr. W. W. Saunders, F.R.S.; the following prizes were offered:—

"For a 'School' Microscope, to be sold to the public at a price not exceeding 10*s.* 6*d.*"—*The Society's Medal.*

"For a Teacher's or Student's Microscope, to be sold to the public at a price not exceeding £3 3*s.*"—*The Society's Medal.*

The council undertook to purchase 100 of the smaller, and 50 of the larger instruments for which the medals should be awarded.

The members will be glad to learn that for these prizes there have been numerous competitors. After most careful examination of all the instruments by the committee, they unanimously reported to the council that the instruments sent in by Messrs. Field and Co., of Birmingham, fulfilled all the conditions required, and the council have, therefore, awarded to that firm the medals offered, on Messrs. Field and Co. entering into the necessary undertakings to comply with the requirements of the Prize List. The council congratulate the members on this result. Those members who are desirous of securing any of these instruments, which will shortly be supplied to the society by Messrs. Field, at a discount of 10 per cent., should at once send in their names to the secretary.

In addition to the papers and objects alluded to above, for which medals have been awarded, some few of the inventions which have been sent in for consideration by the society's committees have been deemed worthy of reward; but as the labours of the committees are not yet completed, the council deem it right to withhold the publication of any partial list.

The Exhibition of Inventions was held this year in April, it being considered that that time of year was preferable to December, the period at which it has hitherto been held. The number of exhibitors each year continues to increase; and notwithstanding arrangements were this year made giving a much larger space for exhibition, it must be admitted on all hands that the society's model room does not afford sufficient room for the proper display of the articles exhibited.

The council this year has revived the series of picture exhibitions which was commenced by that of Mulready, followed by that of Etty. The present collection contains the works of the late J. J. Chalon, R.A., with a selection from those of A. E. Chalon, R.A., portrait-painter in water colours to Her Majesty.

The great success which attended the society's Centenary Festival at the Crystal Palace last summer, led many to express the hope that the council would each year give the members and their friends a similar opportunity of meeting. It has, therefore, been determined that the one hundred and first anniversary dinner shall be held at the Crystal Palace on Tuesday, the 3rd of July, when his Grace, the Duke of Argyll, F.R.S., has kindly consented to preside. The following gentlemen have already undertaken to act as vice-chairmen:—Viscount Ebrington, M.P., chairman of council; Professor Owen, F.R.S., as representing Science; F. Crossley, Esq., M.P., as representing Manufactures; and J. M. Rendel, Esq., F.R.S., as representing Mechanics and Engineering.

The union of institutions continues to increase steadily. Thirty-six have been this year added to the list, and the union now includes 368 institutions, omitting those that have declined, and that have ceased to exist.

The financial statement of the society's income and expenditure and balance-sheet is given and deemed satisfactory.

ON THE ABERRATION OF LIGHT.

BY THE REV. PROFESSOR CHALLIS,

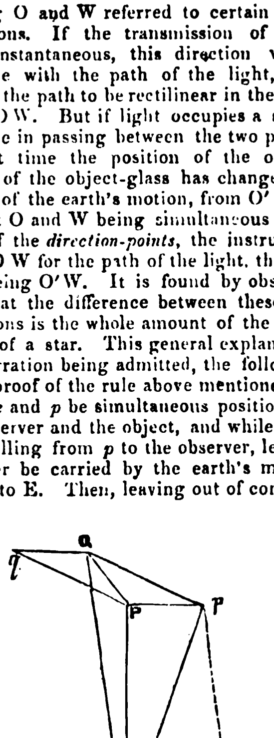
M.A., F.R.S., F.R.A.S.*

The effect of the aberration of light on the apparent place of any body of the solar system, is taken account of by the astronomical calculator on the following principle: The apparent direction of the body, as affected by aberration, is its real direction at the instant the light by which it is seen started from it. This rule is enunciated by Dr. Young in vol. ii. of his "Natural Philosophy" (p. 294), but is not accompanied by proof, and I have not met with any proof of it elsewhere. In order to prove the rule completely, it is necessary first to explain the cause to which aberration is due. In vol. iii. (1852) of the "Philosophical Magazine" (p. 53), I have proposed an explanation of aberration which may be briefly stated as follows. In every determination of the apparent place of a celestial object by an optical instrument, the light from the object passes actually or virtually through

* Communicated by the author to the *Philosophical Magazine.*

two points rigidly connected with the instrument. One of these is necessarily the optical centre of the object-glass, and the other is a point in the field of view of the telescope, which we may suppose to be coincident with the intersection of two wires. Let, at the instant of an observation, O be the position of the first point, and W that of the other. Then the instrument gives by its graduation and by a note of time the direction of the line joining O and W referred to certain fixed directions. If the transmission of light were instantaneous, this direction would coincide with the path of the light, supposing the path to be rectilinear in the short space O W. But if light occupies a sensible time in passing between the two points, in that time the position of the optical centre of the object-glass has changed, by reason of the earth's motion, from O′ to O; so that O and W being simultaneous positions of the *direction-points*, the instrument gives O W for the path of the light, the real path being O′W. It is found by observation that the difference between these two directions is the whole amount of the aberration of a star. This general explanation of aberration being admitted, the following is the proof of the rule above mentioned.

Let e and p be simultaneous positions of the observer and the object, and while light is travelling from p to the observer, let the observer be carried by the earth's motion from e to E. Then, leaving out of consideration any causes, such as atmospheric refraction, which may affect the course of the ray before it enters the telescope, the object is seen by the observer when at E by a ray which has described the path pE. Draw pQ parallel and equal to eE, and join EQ. Thus by reason of aberration as above explained, the *instrumental* direction of the object is EQ. In the time that light takes to pass from p to E, let the object move from p to P, so that EP is its real direction at the instant of observation. Consequently the angle QEP is the difference between the instrumental and the real directions. Draw Qq parallel and equal to pP, and complete the parallelogram QqPp. Now the earth being conceived to be at rest, the apparent angular motion of the body in the interval of the transit of light from p to E is the angle subtended at E by the resultant QP of the motion Qq of the body and the motion Qp equal and opposite to that of the earth, viz., the angle QEP. Hence EQ, the instrumental direction of the body at the time of observation, coincides with its actual direction at a time preceding the observation by the interval occupied by the passage of the light from the body to the observer. This result establishes the rule it was proposed to demonstrate.



It follows from this theory that the instrumental direction of a terrestrial object, whose motion in space is parallel and equal to that of the observer, coincides with the actual direction; and that the instrumental direction of a fixed object, as the sun, and of an object having a fixed direction, as a star, differs from the actual direction by the whole amount of instrumental aberration. The theory also shows that the value of the constant aberration may be in some degree affected by the retardation which the light undergoes in that part of its course between the direction-points O and W, which lies within the substance of the object-glass, or passes through other glasses.

Cambridge Observatory, May 11, 1855.

HUGHES AND DENHAM'S PATENT MANUAL PIANOFORTES.

On Saturday evening last, a specimen of these novel instruments was exhibited at the Royal Polytechnic Institution, on which occasion a descriptive paper was read by Mr. Hughes, the inventor, and several pieces were performed by Mr. Reynolds, the organist of St. Bride's, Fleet-street. The great feature of the invention consists in a new arrangement of the keys, the objects being to render the execution of difficult passages much more easy, and to enable the performer to produce effects altogether surpassing in fulness and power everything attainable on the ordinary pianoforte. The natural scale, arranged on the common pianoforte in one row of white keys, is here arranged in two rows: the first row being in thirds—c, e, g, b, &c., while the row behind it contains the intermediate notes, likewise in thirds—d, f, a, c, &c.; and there is a third row of black keys as on the ordinary instrument. Consequently the

key-board is only one-half the ordinary length, and twice the number of notes are brought under the same stretch of the hand, without any diminution of the width of the keys. Considerable ingenuity has been displayed in the arrangement of the black keys just mentioned. It is evident, that since ten of these have to be comprised in a space rather less than that occupied by eight of the white keys which are of the ordinary breadth, some contrivance had to be adopted by which the necessary finger-space,—viz., that occupied by one white key—should be provided. For this purpose the inventor has reduced the breadth of the black keys in such manner that the space between the alternate ones is just that which is required.

The performance, by Mr. Reynolds, of Mendelssohn's Wedding March, a Fantasia, "The Standard Bearer," and the Overture to Zampa, was amply sufficient to show that the new instrument puts into the hands of the musician the means of producing effects of a very extraordinary and striking character, even when executing existing pieces. But these are not the only advantages it possesses; for it is evident that, with the largely-increased number of notes under the control of the performer, the composer will be at liberty to develop ideas and feelings the expression of which has hitherto lain altogether beyond the scope of the ordinary pianoforte.

In expressing our admiration of the qualities of this instrument, we have not confided exclusively in our own judgment, because persons of mechanical avocations are apt to be distrusted (and probably apt to be deceived also) in matters relating to the arts. But we are able to add to our own testimony the fact that, after the conclusion of Mr. Reynolds' performance, very high opinions were expressed of the new instrument by Mr. Hullah, Mr. Aguilar, and other persons of eminence in the department of music; and a distinguished musical critic says:—"It is evident that this arrangement must have many advantages, particularly in the execution of arpeggio passages, and in the production of much fuller and more extended harmony than is practicable on the common pianoforte."

The ease and facility with which Mr. Reynolds ran through the various scales, and produced the tenth, octave fifth, sixth, and fifteenth, at the request of the gentlemen present, called forth the admiration of the company, and both demonstrated the perfect control possessed by the performer over the instrument, and indicated what effects may be expected to be obtained from it by means of only ordinary assiduity in *practising* it.

There is one objection to the new instrument, and this arises from the difference of the methods of fingering required in these and in the ordinary instruments. We cannot, however, believe that this objection will be considered of sufficient importance to outweigh the numerous advantages associated with the change.

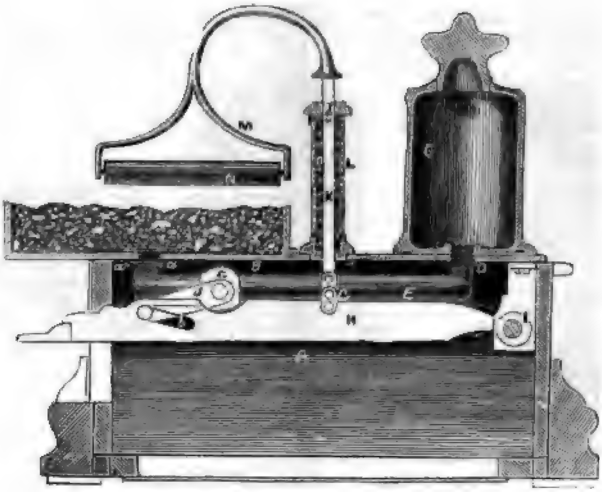
It must be remembered that the absolute difficulty experienced in learning the improved instrument will, in many instances (as in the case of young ladies with small hands), be much less than that now experienced with the common pianoforte, while the effects produced may in all cases be very greatly improved. Other advantages are associated with the improvement in the key-board, including the attainment of increased portability, the new instrument occupying but little more than half the space required for others of equal power. Finally, pianofortes of the new method of construction are manufactured at a cost twenty per cent. less than that of ordinary ones. It should be added, that the improved key-board may be applied, at a small expense, to existing instruments of all descriptions.

PHELPS' PATENT LABEL-DAMPER.

Mr. Phelps, of Croydon, has patented a very compact and efficient apparatus to be used for damping stamps and labels of every description, which will be found of great service in offices, shops, railway stations, &c. It consists of a mahogany or other case, provided with a reservoir of liquid, which is connected by means of a pipe with a case carrying a sponge or other suitable porous substance, the communication between the reservoir and case being opened or closed by means of a lever which acts upon a cock placed in the pipe. It is also provided with a roller, which can be brought down upon the sponge, if required, so as to keep the surface of the stamp or label in contact with it. For labels such as those employed by chemists and shopkeepers in general, the roller will be found very useful, as it will keep the label in contact with the sponge along its whole length, while small articles, such as postage and receipt stamps, will not need the roller, which may, when these only are being used, be turned back or put out of gear. Or the case containing the sponge may be prolonged beyond the roller, and the stamps damped on the extended portion.

The accompanying engraving represents a longitudinal section of such an apparatus, particularly adapted for damping labels for shops, railway stations, and other similar places. A A is a box or stand, on the top of which is screwed the metal plate or cover,

B; C is a reservoir for containing water or other damping liquid. This reservoir is secured to the plate, B, at D, where it is also in communication with the pipe, E, which is continued along the under side of the plate, and secured at its opposite end by the screws, *a a*, where it opens into the trough or box, F. This box, F, is cast in a piece



with the metal plate, and contains a piece of sponge or other porous substance, which absorbs the water from the reservoir, C, and is thus kept constantly moist. G is a cock upon the pipe, for regulating the flow of the water from the reservoir to the sponge. H is a lever having its fulcrum at I, in the side of the box. The opposite end of the lever projects beyond the end of the stand, A, where it is flattened out so as to form a thumb-piece for the purpose of pressing down the lever, a slot being cut in this end of the stand to admit of this action. J is a crank upon the square end of the plug of the cock, G, the other end being provided with a stud pin, which is passed through a slot, *b b*, in the lever, H. By this means, when the lever is depressed, the crank is drawn down, the cock opened, and the water allowed to flow from the reservoir to the sponge. K is a rod connected by the link, *c*, to the lever, H, and passed up through the plate, B, and column, L, where it is bent round and formed into the fork, M, in which the spindle of the roller, N, is supported. The column, L, is hollow, and contains a helical spring, O, the lower end of which presses against the bottom of the column, and the upper end against a washer, P, secured by the pin, *d*, to the rod, K. The action of this spring is to keep the roller, N, from off the sponge when not required for use, to sustain the lever, H, in its raised position, and to keep the cock, G, closed.

When using this apparatus, the label is placed upon the sponge, and the roller brought down upon it by pressing upon the end of the lever, H; the label is then drawn across the sponge, and the lower surface thereby thoroughly damped, the roller keeping all parts of the label in contact with the sponge. Instead of water, a solution of gum or other adhesive compound may be supplied in the reservoir. When damping postage or receipt stamps the roller would not be required, the trough, F, being made, as we have suggested, sufficiently long for that purpose. A recess is made in the side of the box for holding the labels, stamps, and other like articles required for use.*

KNIGHT'S PATENT HEATING APPARATUS.

Messrs. T. and S. Knight, of Southwark, patented on the 29th of November, 1854, a commodious and useful apparatus for heating water for baths and other purposes, composed of a boiler and grate which may be so formed that they may be readily fitted in an ordinary fire-place and chimney; the grate, in this case, answering the purposes of an ordinary fire-grate when required. The boiler itself consists of a dou-

* A specimen of this apparatus will shortly be exhibited in the Gallery of Inventions at the Crystal Palace.

ble four-sided vessel, the inner sides of which are connected by tubes through which water circulates, and which are placed across the chimney so that the flame and products of combustion are made to pass between them in their passage into the flue. When the apparatus is applied to the heating of water for a bath, the bath is connected with a chamber at the upper part of the boiler, by a pipe suitably situated, and the boiler is fed from a cistern, with which also it is connected by pipes suitably disposed.

The accompanying engravings represent

Fig. 1.

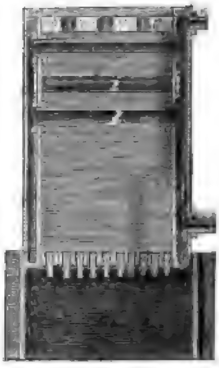


Fig. 2.

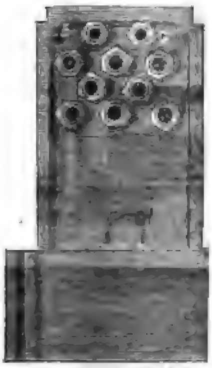
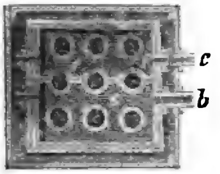


Fig. 3.



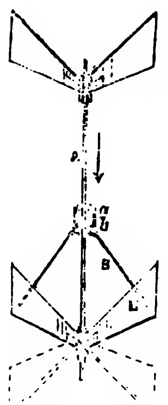
the invention as applied to an ordinary fire-place and chimney, and arranged to supply a bath, or other vessel, with heated water. Fig. 1, represents a vertical transverse section of the apparatus taken through the boiler. Fig. 2, a view of one side of the apparatus, with the outside plate off. Fig. 3, a horizontal section taken through the chamber at the top. In the arrangement here shown, there are three pipes, *a*, *b*, *c*, connected to the boiler. The first, *a*, situated at the bottom, is for the admission of water from the feed cistern, and just over the mouth of it is placed a curved or bent plate, *d*, the object of which is to cause the water to pass through the tubes of the boiler before finding its exit. The other two pipes, *b*, *c*, are fitted to the upper part of the boiler; one, *c*, leading up to the cistern, and being connected to the side of the boiler, and the other, *b*, being connected to the bath or other vessel to which the water is to be supplied. This pipe, *b*, passes through the side of the boiler, and is connected with the box or chamber, *e*, which forms the top of the boiler, and which contains a division plate, *f*, through the centre, from side to side, so that water is drawn off from that half only of the chamber, *e*, which the pipe, *b*, enters. There is also a stop or bent plate, *g*, placed near the top on the opposite side of the boiler to that which the pipes enter, which stop or plate is for the purpose of causing the water to pass over the fire before it can enter that division of the chamber, *e*, from which the pipe, *b*, leads. The apertures or spaces, *h*, through the chamber, *e*, are for the passage of the flame and products of combustion after they have passed among the transverse tubes, *i*, *i*.

WALLIS'S AMERICAN PADDLE-WHEEL.

Figs. 1 and 2 of the accompanying engravings represent respectively a front and a side view of a paddle-wheel, which has been recently patented, in America and other countries, by Mr. J. U. Wallis, and of which the following description is given in a recent number of the *Scientific American*. "A is a wheel to which the paddles, B B, are attached. These paddles may be of wood or metal; they are attached by one side only to the side of the wheel, A, and are to be of trapeziform or trapezoidal shape, the end furthest from the wheel being wider than the end which is attached thereto. They are oblique to the plane of the wheel, and are arranged in pairs, one opposite another on opposite sides of the wheel, each pair presenting the form of the letter V, the point of the V being arranged to enter and leave the water first. Their attachment to the wheel is by hinge joints, *b b*. This mode of attaching them serves a double purpose, viz., first, it allows their obliquity to be varied by the screwing in and out of screws, *a a*, against the heads or points of which they are held by the resistance of the water when in operation; and, second, it allows their positions to be exactly re-

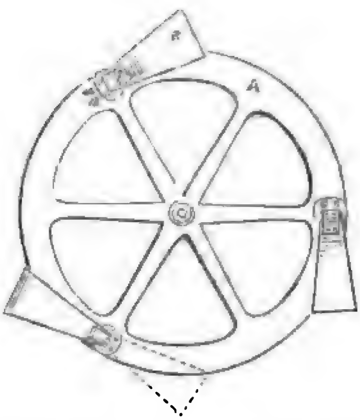
versed when the direction of the revolution of the wheel is reversed. The screws, *a a*, are screwed into the wheel not far

Fig. 1.



from the hinge joints, *b b*, and two sets are provided, one on either side of the hinge joints, so that the paddles may be supported in going ahead or reversing. The paddles

Fig. 2.



are always brought to their own proper position by the resistance of the water, so, as soon as the direction of the revolution of the wheel is reversed, the paddles are reversed by its action. In fig. 1 the direction of the supposed revolution of the wheel is indicated by an arrow.

"The action of the paddles," continues our contemporary, "is such that they enter and leave the water nearly edgewise, and meet with but little resistance, except when they are below the axis of the wheel, and moving nearly horizontally, at which time all the power exerted is effective in propelling the vessel. The attachment of the paddles by hinges, and supporting them near the hinges, gives them such a degree of flexibility or elasticity that when the resistance met with is very great, they will, in some measure, relieve the engine of strain by being drawn towards each other. During last month, the steamboat represented made a number of trips on the East River, and created no small stir among those interested in the progress of steamboat engineering. The boat is 32 feet long, 6½ feet beam, and draws 16 inches water. She has an oscillating engine, with a cylinder of 5 inches bore and 10-inch stroke, carrying steam at 120 lbs. pressure. The same boat, with the old common paddles, made an average speed of about 5 miles per hour. With these new paddles, carrying fifteen passengers, her speed was increased to about 8 miles per hour. It was remarked that no jar was felt when the buckets entered the water, and very little water-lift was observed. Softly and smoothly the little boat glided through the water, to the delight of all on board."

RAILWAY AND MARINE SIGNALS.

A very useful application of Captain Norton's frictional exploding signal was practically demonstrated at the Polytechnic Institution on Saturday last. The object is to fire the alarm-signal some fifty yards in *front* of the engine-driver. This is effected by the pressure of the engine against a connecting wire or cord stretched across the rail breast high, from a post or rod on one side of the line, round another on the opposite side, and tied to the igniting-wire of the signal. The pressure of the engine draws the cord and fires the signal in *front* of the driver. At the same time a floating marine danger-signal was also exhibited. This signal is in the form of a buoy, the covering or lid projecting about two inches beyond the body of the buoy; the frictional-igniter is placed in the centre of the lid, and on the ship pressing against the projecting lid, the igniter fires the charge, the pressure being from the circumference to the centre when the igniter is placed. We may here add, that all Captain Norton's inventions are now practically exhibited in the Rosherville-gardens, near Gravesend.

GALLERY OF INVENTIONS.

The directors of the Crystal Palace Company have wisely determined to appropriate a portion of their beautiful building to the exhibition of inventions, and have accordingly apportioned the gallery of the principal transept, over the entrance from the

Norwood-road, to this purpose. Henceforth, therefore, inventors have at their disposal a means of bringing their productions before the public eye, free of charge. Although we are not sanguine in our expectation of very beneficial effects proceeding from this arrangement, especially in the case of really valuable inventions, we are aware nevertheless, that it is one which will afford many persons an opportunity of testing the value of their ideas and opinions in a manner much to their own satisfaction.

GALVANIC BATTERIES.—USE OF ALUMINIUM.

M. Hulot, one of the chiefs in the electrotypic department of the Mint, has discovered that the newly-discovered metal, aluminium, may replace platina as an element of the galvanic pile, and that this metal having zinc as an electro-negative element, gives rise to a considerable disengagement of hydrogen for several hours.—*Intelligencer.*

SPECIFICATIONS OF PATENTS RECENTLY FILED.

Pettitt, Edwin, of Manchester, Lancaster. *Improvements in machinery for drawing cotton and other yarns.* Patent dated November 30, 1854. (No. 2518.)

Claims.—1. Constructing grip flyers of various described forms or arrangements. 2. Constructing machinery for drawing yarns by the application of grip flyers constructed as described, in combination with a back or first pair, and a front or second pair of rollers.

Mason, John, of Rochdale, Lancaster, machinist, and Leonard Kaberry, of Rochdale, manager. *Improvements in machinery or apparatus for preparing, spinning, and doubling cotton and other fibrous materials.* Patent dated November 30, 1854. (No. 2519.)

This invention relates—1. To teazers or other machines for opening or cleaning cotton, wool, and other fibrous materials in which a grating is employed, and consists in cleaning such grating by the action of travelling brushes, scrapers, or other such apparatus, actuated by connection with any suitable part of the machine. 2. To the carding engine, and consists in an arrangement for actuating the doffing comb whereby an outside crank may be used without exposing the driving strap thereof to the waste material or dust. 3. To a method of adapting brushes of certain materials to the twisting-plate or guide of condenser carding engines, and consists in forming the said brushes cylindrical, or partly cylindrical, so that the cavities for their reception may be constructed by a rotary cutter. 4. To the "centrifugal flyers" of preparing machinery, and consists in turning the upper end of the wire downward instead of upwards as now practised. 5. To the cap bars of preparing and spinning machinery, and consists in certain methods of constructing and fitting up those parts. 6. To machines in which bobbins are employed on both sides of the machine, the spindles of which are required to revolve at a varying speed during the raising and lowering of the bobbins, and consists in causing the lift to take place simultaneously on both sides of the frame. 7. To machines which are provided with fixed bearings and moveable plates for lifting the bobbins, and consists in so varying the speed of the spindles that the velocity shall be increased as the bobbin descends, and *vice versâ*. 8. To machines which, as above mentioned, are adapted for driving the spindles at a varying velocity, and consists in the adaptation to such machine of a driving-shaft situate across one end thereof, and provided with one of a pair of conical pullies or friction surfaces. 9. To slubbing and roving frames, and consists in a method of lifting one of the conical pullies in order that the strap may be shifted. This is accomplished by employing a shaft extending vertically and provided with a handle by which it may be turned. This shaft acts directly upon the conical pulley, for which purpose it is provided with an inclined plane, screw, or cam.

Taylor, William, of Howwood, Paisley. *Improvements in steam boiler and other furnaces.* Patent dated November 30, 1854. (No. 2520.)

In carrying out this invention, a small fireplace, furnished with fire-bars, called the igniting fireplace, is formed at the front end of the furnace; and at a somewhat higher level, and beyond this fireplace is the bottom of the furnace, which is close, and formed by preference of cast iron. Under this bottom there is a space for the passage of air from the back to the front, and at the fore end of the close bottom there is a passage behind the bridge of the igniting fireplace, which bridge inclines backward, so that the air rising from below the close bottom of the furnace (where it has become heated) is caused to sweep over the fuel laid upon it. Behind this first furnace similar close bottom furnaces are constructed, as many in number as may be required.

Sands, John, of Austin-friars, London. *Improvements in the mariners' compass.* (A communication.) Patent dated November 30, 1854. (No. 2521.)

These improvements consist in applying a series of magnets around the basin or frame within which the compass card is suspended, for the purpose of counteracting

local attractions, each magnet having adapted to it means of readily adjusting its position in respect to the axis of the compass card and the magnetic needles combined therewith. It is preferred that each compass card should have two magnetic needles fixed parallel to each other.

LE MESURIER, FREDERICK, of Guernsey, gentleman. *An improvement in the manufacture of ball and shot cartridges.* Patent dated November 30, 1854. (No. 2523.)

The object of this invention is to avoid the necessity of biting off the end of the cartridge, for which purpose when a ball-cartridge has been filled with powder a thin piece of wood is introduced into and cemented to the case to close it, and when the contents are to be emptied into the barrel of a fire-arm, by pressing the edges of the wood at the end of the cartridge, part of it will be broken away and allow the powder to flow out of the case.

ROWLAND, ELLIS, and JAMES ROWLAND, of Manchester, Lancaster, engineers. *Certain improvements in metallic pistons.* Patent dated November 30, 1854. (No. 2524.)

Claim.—The application and use of a stop-piece for the purpose of forming steam-tight joints at the junction of the rings of pistons, having on its face two indented inclined planes and two surfaces (upper and lower) for working against the sides of the cylinder, as described.

WHITWORTH, JOSEPH, of Manchester, Lancaster, engineer. *Improvements in cannons, guns, and fire-arms.* Patent dated December 1, 1854. (No. 2525.)

This invention consists primarily in constructing cannons, guns, and the barrels of fire-arms in separate parts, and uniting together, by means of hoops or belts, two or more segments made of a particular shape, which, when so united, form a cannon or other piece of ordnance, or the barrel of a fire-arm, the interior of which may be rifled, not by boring and cutting grooves in it as in the ordinary mode, but by making the interior in the form of a hollow polygonal spiral of the requisite pitch and number of threads. We shall probably publish a full description of this invention shortly.

BRIGGS, EDWARD, of Castleton Mills, near Rochdale, Lancaster, manufacturer, and WILLIAM SOUTER, of the same place, manager. *Improvements in machinery and apparatus for gassing yarn and thread.* Patent dated December 1, 1854. (No. 2526.)

This invention consists in the combination and arrangement of machinery and apparatus for gassing yarn or thread in the hank, in contradistinction to the method commonly practised of gassing it as it is unwound from one bobbin and wound on another.

BERNARD, JULIAN, of Club-chambers, Regent-street, Middlesex, gentleman. *Improvements in the manufacture of boots, shoes, or other protectors for the feet, and in the machinery or apparatus connected therewith.* Patent dated December 1, 1854. (No. 2528.)

This invention relates—1. To a mode of uniting wooden heels and soles to the other parts of boots and shoes by first cementing them, and then subjecting them to pressure. 2. To a mode of uniting the various parts of boots and shoes together in vacuo. 3. To a mode of heating the cement and various parts of boots and shoes. 4. To a novel kind of last. 5. To a mode of uniting the sole or soles and heels to the other parts of boots and shoes. 6. To certain apparatus for carrying the invention into effect.

RESTELL, THOMAS, of the Strand, Westminster, chronometer maker. *Improvements in guns.* Patent dated December 1, 1854. (No. 2530.)

This invention relates to breech-loading guns and consists in a means of introducing the charge from a turning breech, and of firing the same, both operations being performed by pushing and pulling the trigger or only by pulling the same. The inventor dispenses with the ordinary lock and substitutes for it an apparatus which works within a tube which may form a continuation of the barrel and is carried on behind the breech, mounting in the tube a hammer for exploding the cap. The cartridges to be employed with the improved gun have a cap fitted on them to be exploded by the hammer inside the breech. To make the gun a repeating fire-arm, the inventor places under the barrel and in such a position as to be coincident with the breech when lowered, a chamber containing several cartridges of the description before mentioned, which are brought forward in succession to enter the breech by the action of a coiled spring against a piston or plug capable of traversing from end to end of the chamber. A locking spring is fitted to the chamber which retains the cartridges in the chamber except when acted on by the turning breech, and it then allows one cartridge to pass into the breech and the next to be brought up into a position for entering the breech when the locking spring is again acted on. When the supply of cartridges in the chamber is exhausted the piston is pressed back and the chamber is opened to admit a fresh supply.

ILES, CHARLES, of Peel Works. Birmingham. *Improvements in metal bedsteads.* Patent dated December 1, 1854. (No. 2533.)

This invention consists—1. In coating the posts and rails of metal bedsteads with plastic cement, or other material in a plastic state, for the purpose of increasing their size

and facilitating their ornamentation. 2. In connecting the laths to the rails by means of notches and corresponding projections. 3. In making stretchers so that one part shall slide within another, and be extended or shortened by means of eccentrics.

WITTY, ROBERT CHRISTOPHER, Torriano-avenue, Camden-road-villas, Middlesex, engineer. *Improvements in illumination by means of artificial light.* Patent dated December 2, 1854. (No. 2534.)

This invention consists in placing a reflector with several reflecting surfaces, or a set of reflectors, within a flame or amongst several flames, or within a series of jets of flame arranged in a circle, or in any other convenient position, for the purpose of increasing the illuminating effect of the light given out by such flame or flames!

BAZAINE, DOMINIQUE, of Paris, France, head engineer "des Ponts et Chaussées." *An improved system of railway, applicable especially on common roads.* Patent dated December 2, 1854. (No. 2536.)

"My improved rails," says the inventor, "are made of rolled iron of a particular shape, somewhat resembling the common single T-shaped rail, with this difference, that the widened part of my new rail is provided with a wheel rut and counter rail for the passage of the flange at the rim of the wheels. Such rails rest on cast iron chairs placed at suitable distances." He describes several forms and combinations.

GANTERT, LONGIN, dyer, Glasfort-street, Glasgow. *Improvements in machinery or apparatus for dyeing and bleaching of yarns or threads.* Patent dated December 2, 1854. (No. 2537.)

This invention consists—1. In a number of improvements on the yarn tramping and squeezing machine invented by the patentee. 2. In a yarn-washing machine through which the yarn travels from one end to the other whilst the water flows the contrary way. 3. In a mechanical dye-boiler for yarns, heated by steam without condensation in the dye-bath, or by fire, or by both at the same time, by which the yarn is moved continually during the dyeing process.

BIDEN, JAMES, of Gosport, Hants. *The prevention of smoke from furnaces.* Patent dated December 2, 1854. (No. 2538.)

A full description of this invention was given in our number for June 9 last (No. 1661.)

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in apparatus for the manufacture of combustible gas.* (A communication.) Patent dated December 2, 1854. (No. 2539.)

Claims.—1. The application of inverted covers, dipping into hydraulic lutes or cups, for closing the mouths of retorts or other vessels used in the manufacture of combustible gas by the decomposition of water, steam, or aqueous vapour. 2. A certain described combination and application of a boiler and apparatus for supplying steam to retorts used in the manufacture of combustible water-gas. 3. The application of a piston or hammer to retorts or other close vessels used in the manufacture of combustible water-gas, for the purpose of moving and agitating their contents, &c.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

ANDERSON, SIR JAMES CALEB, of Fermoy, Cork, baronet. *An economical railway for the conveyance of passengers, goods, and letters.* Application dated November, 30, 1854. (No. 2514.)

In carrying out this invention the rails are placed in a closed chamber, and to work the line, high-pressure engines are fixed at such distances as may be found requisite. On the top of the chamber which encloses the rails the chimneys of the engines are to be placed. The exit steam of each engine is to be permitted to escape at a good pressure into its chimney. By this arrangement the air in the chamber is to be drawn up the chimney, and thus a strong current of air caused, which current is to act upon the rear of the carriage and impel it.

WELCH, EDWARD, of George-street, Portman-square, London, gentleman. *Improvements in fire-places and flues, and apparatus connected therewith.* Application dated November 30, 1854. (No. 2515.)

The inventor proposes attaching to the sides of the grate, or around it, a wrought-iron box (with or without a syphon), or a series of boxes, into which may be admitted the smoke or hot-air from the fire, or hot water, or gas, for the purpose of aiding the fire in warming the air brought into contact with the box or syphon.

QUIQUANDON, JEAN BAPTISTE ANDRÉ, mechanician, of Ambert, French Empire. *Certain improvements in manufacturing corks, and in the mode of employing their residues or wastes.* Application dated November 30, 1854. (No. 2517.)

The inventor describes a method of mounting a number of pieces of cork in the same frame, and of shaping them, two at a time, by means of circular revolving rasps and cutters. He mixes the cork powder obtained in the process with caoutchouc, gutta percha, resin, tar, boiled leather, papier maché, kaolin, felspar, or other plastic composition capable of being moulded, stamped or carved, and manufactures of the mixtures thus obtained articles of decoration, furniture, &c. The powder may also be used for

stuffing bedding and dolls, and for similar purposes.

MURRAY, CHARLES, of Bignia Cottage, Havile-street, Camberwell. *Improvements in the manufacture of ordnance, barrels of fire-arms, and hollow cylinders of iron.* Application dated November 30, 1854. (No. 2522.)

The inventor proposes to construct ordnance, &c., of several cylinders of metal placed one over another with the grain crossed. For this purpose the iron is first to be rolled into slabs tapering towards the edges, the tapering being from the middle of each slab outwards towards both edges, so that when a slab is bent into a tubular form the bore will be eccentric, and where the weld is made the metal will be thin, whilst at the opposite side of the cylinder it will be comparatively thick.

ARROWSMITH, JOHN, of Bilston, Stafford, engineer. *A new or improved method of construction, applicable to forts, floating batteries, powder magazines, beams, or girders, and other structures, where great strength is required.* Application dated December 1, 1854. (No. 2527.)

The inventor constructs metallic bars or plates with ribs or feathers, and others with corresponding grooves, and lays them upon one another alternately, so that the ribs or feathers in the one occupy the grooves in the other. The bars or plates thus piled on one another are bound together by transverse bars, riveted or otherwise fastened to them.

WILSON, THOMAS, of Moscow-road, Bayswater, Paddington, Middlesex. *Preventing the noise in omnibuses and other carriages travelling on common roads, streets, and railways.* Application dated December 1, 1854. (No. 2529.)

This invention consists in the introduction of India-rubber blocks between the axletree and springs, in place of the wooden blocks now in use; and also in the prevention of the noise arising from the rattling of the windows by lining the frames with India-rubber.

CANTELO, WILLIAM JAMES, of Leicester-square. *An improvement in the construction of barrels of ordnance and small arms, and in balls or projectiles used therewith.* Application dated December 1, 1854. (No. 2531.)

This invention consists in fixing in a slot or opening made near the fore-end or muzzle of a smooth barrel an inclined projection, in such manner that a ball or projectile in being projected from such a barrel will, just before passing from it, be caused by the projection to rotate on its axis.

LITTLETON, THOMAS, of Saltash, Cornwall, bachelor of medicine and Fellow of the Royal College of Surgeons of England. *Improvements in separating gases from sewage, and other waters, for the manufacture of manure, and for the supplying of steam-engines.* Application dated December 1, 1854. (No. 2532.)

"This invention consists in separating gases from water in which the same are held in solution by subjecting the fluid to the action of a vacuum, the vacuum being produced by the fall of water from a chamber which is situated at a sufficient height from the outfall for the water by its own gravity to descend and leave a vacuum in the chamber."

HESS, RICHARD, of Chapel-cottage, Holloway-road, Middlesex, engineer. *An improved voltaic battery for medical and philosophical purposes.* Application dated December 2, 1854. (No. 2535.)

This improved battery is composed of a number of compound plates, each plate being composed of two plates of different metals soldered or otherwise brought into close contact with each other, one metal being negative and the other positive. Between each pair of compound plates is interposed a plate of fibrous or absorbent substance, as paper, wood, felt, &c., and the whole is kept together by a rod composed of some non-absorbing and non-conducting substance, passing through the whole.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Castle-street, London. *Improvements in the manufacture of paper and pasteboard.* (A communication.) Application dated December 2, 1854. (No. 2540.)

These improvements consist in applying to the manufacture of paste and pasteboard the down or cotton gathered from thistles of any kind, and also the plants known as the moss and lichen.

*** The documents of Nos. 2516 and 2548 are with the law officers under first reference.

PROVISIONAL PROTECTIONS.

Dated February 21, 1855.

379. Julien Aimable Telle, of Paris, France. A system of railways to be used in the interior of cities and towns.

Dated March 13, 1855.

557. Eugène Bourseret, mechanician, of Paris, France. Improvements in machines for manufacturing, bolts, rivets, and other similar articles.

Dated March 22, 1855.

635. James Snowden, of Dartford, Kent, engineer. An improvement in furnaces and other fire-places.

Dated March 26, 1855.

667. Henry Charles Hill, of Parker-street, Kingsland, Middlesex. Improvements in the manufacture of waterproof flock cloth and other fabrics.

Dated April 3, 1855.

745. Louis Cornides, of Trafalgar-square, Char-

ing-cross. Certain improvements in saturating and coating or covering leather, paper, and textile fabrics, so as to render the same on the coated or covered surfaces thereof impervious to water.

Dated April 13, 1855.

817. William Weallens, of Elswick Villas, Newcastle-on-Tyne, mechanical engineer, and George Arthur Crow, of Forth-street, Newcastle-on-Tyne, mechanical engineer. Improvements in marine steam-engines.

Dated April 19, 1855.

865. Thomas Jackson, of Commercial-road, Pimlico, Middlesex, contractor for public works. Improvements in signals for railway trains.

869. Charles M'Ilvaine Congreve, merchant, of New York, United States of America. Improvements in the manufacture of iron when oxide iron ores are used. A communication from Charles Congreve.

Dated May 12, 1855.

1073. James Beckett, of Preston, Lancaster, overlooker. Improvements in machinery for spinning cotton and other fibrous substances, more particularly applicable to the machines generally known by the name of Smith's self-acting mules.

Dated May 18, 1855.

1121. Charles Claude Etienne Minié, of Paris, France. Improvements in breech-loading fire arms.

1123. Edmund Morewood and George Rogers, of Enfield, Middlesex. An improvement in coating wrought iron.

1125. William Henry Dearing Granville, of Stokenchurch, Oxford, schoolmaster. Improvements in firearms, and cartridges for the same.

Dated May 21, 1855.

1127. Walter Henry Tucker, of Fleet-street, London, lock manufacturer. Improvements in locks.

1129. Henry Hough Watson, of Little Bolton, Lancaster, analytical chemist, and James Oliver, of Over Hulton, land agent. Improvements in the manufacture of fuel.

1131. Paul Firmin Didot, chemist, of Paris, French Empire. An improved process of bleaching paper pulp, textile fabrics, and other substances or matters.

1133 Frederick William Mowbray, of Shipley, near Leeds, York, engineer. Improvements in looms for weaving carpets and other pile fabrics.

1135. Edward Holmes Bennett, of Birmingham, Warwick manufacturer. Improvements in roasting jacks.

1137. Harry Whitaker, of Buffalo, New York, United States of America. Improvements in the propulsion of steam vessels by a direct application of a crank outside the hull to side screw propellers, such application being combined with a high pressure engine also outside of the hull.

1139. Ignace Joseph Silbermann, jun., of Paris, France. Improvements in printing on any kind of surfaces.

1141. William Longmaid, of Victoria-cottage, Stoke Newington, and John Longbottom, of Leeds. Improvements in heating coppers, pans, and boilers.

1143. Thomas George Shaw, of Old Broad-street, London, wine merchant. An improved conductor to be used in the decantation of wine or other liquids.

1145. William MacNaught, of Manchester, Lancaster, engineer. Certain improvements in steam boilers or generators.

1147. James Shanks, of Arbroath, Forfar, machinist. Improvements in mowing machines.

1149. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in the process of vulcanising and rendering hard India-rubber and gutta percha, and in the application of those materials when hard to the construction of parts of machinery or apparatus employed in the preparation and manufacture of fibrous materials and textile fabrics. A communication.

Dated May 22, 1855.

1151. Henry Emmanuel Scott, of Brixton, Surrey, civil engineer. Improvements in ships and other floating vessels.

1153. George Collier, of Halifax, York. Improvements in looms for weaving carpets and other fabrics.

1155. Thomas Holt, of Blackburn, and John Sagar, of Cabin-end, near Blackburn, Lancaster. Improvements in looms.

Dated May 23, 1855.

1157. Johan Jacob Meyer, of Rochdale, Lancaster, cabinet maker. Improvements in machinery or apparatus for shaping wood and other materials.

1159. James Eden, of Lytham, Lancaster, bleacher. An improved mode of drying fabrics.

1161. David L. Davis, of Dedham, Massachusetts, United States of America. An improved method of applying elastic bearings to railroad chairs and rails.

1163. Alfred Vincent Newton, of Chancery-lane, Middlesex, mechanical draughtsman. Certain improvements in bee-hives. A communication.

1165. William Smith, of Salisbury-street, Adelphi, Middlesex. A safety apparatus for steam-boilers. A communication from M. Adolphe Lethwilleon Pinel, of Rouen, France.

Dated May 24, 1855.

1167. James Atkinson Longridge, of Newcastle-upon-Tyne, engineer. Improvements in the construction or the manufacture of guns and artillery, and of other vessels intended to resist great pressure.

1169. John Mitchell, of Bury, Lancaster, roller and spindle maker, and James Entwisle, of the same place, foreman. Improvements in presser flyers for roving frames and other machines of the like nature.

1171. Joshua Hudson, of Laurel-place, Dalston, Middlesex, and George Robert Williams, of Stanley-street, Chelsea, Middlesex. Improvements in water meters, which are applicable also for the measurement of other fluids.

1173 George Walker Muir, of Glasgow, Lanark, and Matthew Gray, of Bonhill, Dumbarton, Scotland, engineers. Improvements in admitting and regulating the admission of air to furnaces.

1179. Joseph Addenbrooke, of Bartlett's-passage, London, envelope maker. Improvements in machinery for folding envelopes.

Dated May 25, 1855.

1181. Edwin Haseler, of Wolverhampton, Stafford, artist. An improvement or improvements in frames for pictures, drawings, engravings, and other similar articles.

1183. Alexander Melville, of Baker-street, Portman-square, Middlesex, artist. Improvements in breech-loading fire-arms, and in projectiles used therewith.

1185. Joseph Hippolyte Poullain, of Paris, France. A new or improved pen-holder.

1187. Henry Henson Henson, of Parliament-street, Westminster, engineer. An improvement in the manufacture of fabrics suitable for goods-wrappers, and other purposes for which canvas has been or may be employed.

1189. Auguste Paillard Jaccard, of Sainte Croix, Switzerland, watchmaker. An improved independent centre seconds movement for watches. A communication.

Dated May 26, 1855.

1191. Frederick Herbert Maberly, of Stowmarket, Suffolk, clerk. Improvements in fire-arms.

1192. John Léuthner Lorand, of William-street, Hampstead-road, Middlesex. An improved railway break.

1193. Thomas Mather, of Preston, Lancaster, engineer. Improvements in the construction of pistons.

1197. Alfred Isidore Honoré Parent, manufacturer, of Paris, French Empire. Certain improvements in manufacturing buttons, nails, and metallic and plastic articles.

1199. Charles Weightman Harrison, of Woolwich, Kent, civil engineer. Improvements in metal ropes, cables, and rods, and in machinery for manufacturing the same.

1200. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improved machinery for making envelopes. A communication.

1201. Auguste Edouard Loradoux Bellford, of Essex-street, London. A new apparatus, for regulating the speed of steam engines. A communication.

1203. John Avery, of Essex-street, London. Improvements in apparatus for conveying heavy weights for bridge building and other purposes. A communication.

1205. Gottlieb Neuffer, of Finsbury-square, Middlesex, gentleman. An improved mode of producing patterns upon floorcloths and other ornamental coverings for floors, walls, tables, and other surfaces.

1207. Thomas Waterhouse, of Claremont-place, Sheffield, York. Improvements in the means of actuating forge and other hammers, which improvements are also applicable to pile driving and other like purposes. A communication.

Dated May 28, 1855.

1209. Joseph Bennett Howell, of Sheffield, York, steel manufacturer. A new or improved mode or modes of consuming more effectually the gas and gaseous products evolved during the combustion of fuel.

1211. Benjamin Fullwood, of Kirbey-street, Poplar, Middlesex, manufacturing chemist. Improvements in the purification of mineral, vegetable, and animal matters containing oily, bituminous, resinous, ammoniacal and aqueous qualities.

1213. John Morrison, of Arlington-square, New North-road, Middlesex. A new mode of constructing railways, specially intended to be employed for the transit of carriages or vehicles moved or propelled by human power.

1215. Eugène Michel Roch, of Paris, France. Improved apparatus for reading or bringing into sight bills, advertisements, papers, maps, and similar objects.

1217. Auguste Edouard Loradoux Bellford, of Essex-street, London. Improvements in sewing machines. (A communication.)

1219. John Whitehead, jun., and Robert Kay Whitehead, of Elton, near Bury, Lancaster, bleachers and dyer.. Improvements in finishing woven fabrics.

1221. Henry Grafton, of Rolls-buildings, Fetter-lane, Middlesex. Improvements in apparatus for heating and cooking.

1222. Richard Coleman, of Chelmsford, Essex. Improvements in the construction of land rollers, and in implements for ploughing and breaking up or scarifying the soil.

Dated May 29, 1855.

1223. Daniel Dunn, chocolate manufacturer, of King's-road, Pentonville, Middlesex. Improvements in steam boilers.

1225. Etienne Jules Lafond, engineer, and Count Louis Alfred de Chatauvillard, of Belleville, near Paris, France. Improvements in the processes of, and apparatus for, treating mineral, animal, and vegetable matters, for obtaining oils, essences, paraffine, and other similar products.

1227. Ellis Clowes, of King's-bench-walk, Temple, London, gentleman. An improved construction of spring for resisting sudden and continuous pressure. A communication.

1229. Thomas Vincent Lee, of Prospect-cottage, Dulwich, Surrey, civil engineer. Improvements in generating steam in marine and other boilers.

1231. William Arthur Henry, of the firm of Marchington Brothers, of Bruce Works, Bridge-street, Sheffield, York, machinists, &c. Improvements in vices, and in the mode of securing the same to work-benches.

1233. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in stamping and embossing presses. A communication from Carl Heinrich Otto Fanger, of Graefrath, Prussia.

Dated May 30, 1855.

1235. Robert Dean Aked, of Matilda-street, Caledonian-road, Middlesex. Improvements in the construction of stands for supporting crochet reels when in use.

Dated May 31, 1855.

1237. Emanuel Wharton, of William-street, Birmingham, Warwick, mechanical engineer. Improvements in ordnance and fire-arms.

1238. Emanuel Wharton, of William-street, Birmingham, Warwick, mechanical engineer. Improvements in the machinery for manufacturing metal tubes.

1239. Emanuel Wharton, of William-street, Birmingham, Warwick, mechanical engineer. Improvements in steam-engines.

1240. John Louis Jullion, of Combe House, Tovil, Kent, analytical chemist. The manufacture of paper, card, and millboard, from certain vegetable productions.

1241. James Leetch, of Westminster, Middlesex, gunmaker. An improved construction of helmet or head-dress.

1242. William Rimington, junior, of the firm of Rimington and Son, of Skipton, Craven, Yorkshire, whitesmiths and bellhangers. A new spring hinge for swing doors.

1243. Charles Tennant Dunlop, of Glasgow, Lanark, chemist. Improvements in the manufacture of chlorine.

1244. Sir John William Lubbock, of Mansion House-street, London, baronet. An improvement applicable to telescopes and other similar optical instruments.

1245. Hermann Sachs, of Newgate-street, London, warehouseman. An improved construction of fountain pen.

1246. Samuel Bickerton, of Oldham, Lancaster. An improved oil lubricator.

1247. Antoine Bernard Alfred Baron Espiard de Colonge, of Paris, France. An improved diving apparatus.

1248. Robert Ashworth, of Rochdale, Lancaster, engineer, and Samuel Stott, of Rochdale, Lancaster, cotton spinner. Certain appendages to and improvements in machinery for preparing, spinning, doubling, twisting, and winding fibrous substances.

1249. Thomas Worsdell, of the firm of Worsdell and Evans, of Birmingham, Warwick, engineer. Improvements in lifting jacks.

1250. Richard Archibald Brooman, of 166, Fleet-street, London, patent agent. Improvements in dyeing cotton threads, yarns, and twists. A communication from Charles Joseph Eugene Ab-der Halden, of Mulhouse, France.

Dated June 1, 1855.

1251. Adrien Jackson and Eli Kershaw, of Manchester, Lancaster, power-loom overlookers, and Joseph Roberts, of Failsworth, near Manchester, engineer. Improvements in looms for weaving.

1252. Peter Armand Lecomte de Fontainemo-

reau, of South-street, London. Certain improvements in the treatment of vegetable and animal oils. A communication.

1253. Richard Peyton, of the Bordesley Works, Birmingham, Warwick, manufacturer of bedsteads, and Alexander Southwood Stocker, of the Poultry, London, manufacturer. Improvements in the manufacture of bedsteads.

1254. Charles Isidore Constant Venant, of Amiens, France. Improvements in apparatus for roasting coffee and other substances.

1255. John Charles Pellenz, of Aix-la-Chapelle, Prussia. Improvements in the manufacture of iron wheels.

1256. Richard Whytock, of Edinburgh. Improvements in colouring yarns or threads intended to form elements of various loom fabrics, and for crochet work and knitting.

1257. Henry Spencer, of Rochdale, Lancaster, manager. Improvements in machinery or apparatus for twisting and winding spun yarns or threads.

Dated June 2, 1855.

1258. John Boyd, of Ashbocking, Suffolk, gentleman. Improvements in letter-press printing machines.

1259. John Lane, of Liverpool, Lancaster, merchant, and John Taylor, of Birkenhead, Chester, engineer. An improved engine.

1260. James Taylor and William Smith, of Manchester, Lancaster. Improvements in the chairs of railways.

1261. Clement Coe, of Manchester, Lancaster, merchant. Improvements in the mode or method of manufacturing druggets, bockings, pilot cloths, blankets, or similar strong materials. A communication.

1262. Charles Little, of Derby, engineer. Improvements in machinery or apparatus for the manufacture of envelopes.

1263. Henry Cartwright, of the Dean, Broseley, Salop. An improved steam-cock.

1264. François Celestin Armelin, junior, merchant, of Draguignan, French Empire. Certain improvements in ploughs.

1266. James Taylor Dore, of High-street, Southampton, draper. An improved mode of constructing boxes or cases for holding needles, buttons, and other wares.

Dated June 4, 1855.

1268. Peter Augustin Godefroy, of King's Mead-cottages, Islington, Middlesex, operative chemist in solvents. Improvements in the treatment of gutta percha.

1272. William Eley, of Broad-street, Golden-square, Middlesex. An improvement in the manufacture of detonating caps for fire-arms.

Dated June 5, 1855.

1278. John Gedge, of Wellington-street South, Middlesex. Improvements in securing the contents of bottles or other similar vessels. A communication from Mr. Constant Chevalier, of Paris, France.

1280. David Newell Brown Coffin, junior, of Massachusetts, United States of America. A new and useful improvement in self-closing stop-cocks.

1282. Cyrus Curtice, of Massachusetts, United States of America. A new and improved light alarm or burglar annunciator or apparatus, to give alarm when a burglarious attempt is made to enter a room or dwelling. A communication from Edward Brown and other foreigners.

1284. Ethan Allen, of Massachusetts, United States of America. An improved breech-loading fire-arm.

1286. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. Improved machinery for rolling bar iron. A communication.

Dated June 6, 1855.

1288. John Gedge, of Wellington-street South, Middlesex, patent agent. Improvements in the means of preserving grain. A communication from C. J. Delezenne, of Lille, France.

1290. John Fielding and William Hopwood, of Blackburn, Lancaster, power-loom cloth manufacturers. Improvements in looms.

1292. George Hopper, of Houghton-le-Spring Iron Works, Durham, engineer. Improvements in rolling and shaping metals.

1294. James Robertson, of Ardrossan, Ayr, engineer. Improvements in transmitting motive power in certain circumstances where reversing actions are necessary.

1296. John Boucher, of Surrey-villas, Camberwell New-road, Surrey. Improvements in powder-flasks, and in the sights and ramrods of fire-arms.

Dated June 7, 1855.

1300. John Buncle, of Springfield, Linlithgow, chemist. An improvement in bleaching resinous substances (calophane) for the manufacture of soap.

1302. Thomas Ogden, of Manchester, Lancaster, cotton-spinner. Certain improvements in machinery or apparatus for spinning cotton and other fibrous materials.

1304. John Andrus Reynolds, of Elmira, New York, United States of America, doctor of medicine. Improved machinery for discharging volleys of shot.

1306. Charles Constant Joseph Guffroy, merchant, of Lille, French Empire. An improved smoke-consuming apparatus.

HEARINGS OF APPLICATIONS FOR PROLONGATION OF PATENTS.

The judicial committee of the Privy Council have appointed Friday, June 22, at half-past ten, A.M., for hearing the petition of Frederic John Reed, of Friday-street, London, solicitor, Charles Foard, of the Stock Exchange, London, stock-jobber, and Thomas Shepperson, of Dulwich-hill, Surrey, Esq., for a prolongation of the several letters patent granted to John Juckes, of Lewisham, Kent, gentleman, for "Improvements in furnaces or fire-places," for England, dated September 4, 1841; for Scotland, December 28, 1841; and for Ireland, April 21, 1842.

The judicial committee of the Privy Council have also appointed Friday, June 22, at half-past ten, for hearing the petition of Alphonse René le Mire de Normandy, of Judd-street, Middlesex, chemist, for a prolongation of the patent granted to him September 8, 1841, for "Improvements in the manufacture of soap."

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," June 19th, 1855.)

274. Deane John Hoare. Certain improvements in propelling vessels.

279. Arthur Warner. Improvements in coating or combining sheet iron and steel with sheet lead, zinc, tin, copper, or alloys of such metals.

307. John Lees and William Heap. A new or improved machine or apparatus for cutting and straightening bars of metal.

308. William Beckett Johnson. Improvements in steam-boilers and engines.

314. George Henry Ingall. Certain improvements in telegraphic communication and apparatus connected therewith.

326. Robert Kerr. Certain improvements in

preparing loaf sugar for use, and certain apparatus for the same.

333. George Dalton. Improvements in reverberatory furnaces.

342. James Leadbetter. Improvements in the mode or method of applying breaks to railway and other carriages.

344. John Mason and Samuel Thornton. Improvements in finishing or polishing, and drying yarns or threads.

345. Henry Spencer. Improvements in machinery for preparing and spinning cotton and other fibrous substances.

346. Christophe François Delabarre. Improved apparatus to be used in propelling gases and forcing liquids.

348. Eugene Carless. Improvements in the manufacture of paper-cloth known as artificial leather, and in coating or covering the surface thereof with colouring matter, said colouring process being also adapted to the colouring or staining of paper.

354. Robert Blackburn and William Lundi Duncan. Improvements in bleaching.

371. Henry Schottlander. Improvements in ornamenting looking-glasses.

373. John Harcourt Brown. Improvements in the construction of ball-cartridges for facilitating the loading and lubricating of fire-arms.

379. Julien-Aimable Telle. A system of railways to be used in the interior of cities and towns.

390. Charles Low. Certain improvements in the extraction of gold from its ores.

407. Nathan Thompson, junior. Improvements in constructing life-boats.

415. Hamilton Martin and Joseph Smethurst. Improvements in the construction of fences or casings for shafts, pulleys, and other parts of machinery.

416. Auguste Edouard Loradoux Bellford. Certain improvements in the application of breaks on railways. A communication from W. Loughridge, of Weverton, United States.

425. James Brodie. Improvements in, and applicable to, tongs, pliers, vices, and other holding instruments.

446. Thomas Cook. Improvements in working punkas and apparatus for agitating air in churches, hospitals, and other buildings.

493. Auguste Edouard Loradoux Bellford. Certain new and useful improvements in the oscillating steam-engine. A communication from John Andrew Reed, of New York, United States of America.

531. James Murdoch. An improved method of enlarging or reducing designs, maps, and other similar articles, also apparatus or machinery to be employed in the same. A communication.

545. Auguste Edouard Loradoux Bellford. Improvements in machinery for making butt-hinges of wrought iron or other metal complete at one operation. A communication.

552. John Gilbert. An improved pump or pumping apparatus.

574. Edmund Johnson Mitchell. An improvement in rollers employed in the washing of wool and linen, in the squeezing of sized cotton warps, and other like purposes.

635. James Snowden. An improvement in furnaces and other fire-places.

664. John Henry Johnson. Improvements in machinery or apparatus for dressing flax, hemp, and other fibrous materials. A communication from Jean Jacques Alexandre Lallier, of Evreux, and François Jules Vignaud, of Paris, France.

779. William Tuer, William Hodgson, Robert Hall, and Samuel Hall. Certain improvements in looms for weaving.

785. Samuel Fielding the younger. Improvements in apparatus for oiling or lubricating the pistons of steam-engines.

836. John Cowley and Daniel Peyton Sullivan. Improvements in the manufacture of paper.

986. Henry Lee the younger, and John Gilbert. Certain machinery for mixing the substances used in the formation of concrete and other like substances.

1068. Adam Guild. Improvements in the process of bowking.

1097. Robert Jobson and John Jobson. Improvements in the manufacture of moulds for casting metals.

1098. William Fawcett, John Lamb, and Francis Best Fawcett. Improvements in the manufacture of carpets and other similar fabrics, and in machinery and apparatus to be used therein.

1123. Edmund Morewood and George Rogers. An improvement in coating wrought iron.

1127. Walter Henry Tucker. Improvements in locks.

1129. Henry Hough Watson and James Oliver. Improvements in the manufacture of fuel.

1133. Frederick William Mowbray. Improvements in looms for weaving carpets and other pile fabrics.

1141. William Longmaid and John Longbottom. Improvements in heating coppers, pans, and boilers.

1152. John Cruickshank. An improved construction of offensive and defensive equipment for cavalry.

1153. George Collier. Improvements in looms for weaving carpets and other fabrics.

1159. James Eden. An improved mode of drying fabrics.

1161. David L. Davis. An improved method of applying elastic bearings to railroad chairs and rails.

1162. Thomas McLow. Certain improvements in paddle-wheels.

1163. Alfred Vincent Newton. Certain improvements in bee-hives. A communication.

1178. Thomas McLow. Certain improvements in paddle-wheels.

1207. Thomas Waterhouse. Improvements in the means of actuating forge and other hammers, which improvements are also applicable to pile-driving and other like purposes. A communication.

1214. Auguste Edouard Loradoux Bellford. Certain improvements in ordnance and in cartridges therefor. A communication from Charles Frederick Brown, of Warren, United States of America.

1223. Daniel Dunn. Improvements in steam-boilers.

1234. Thomas McLow. Improvements in screw-propellers.

1253. Richard Peyton and Alexander Southwood Stocker. Improvements in the manufacture of bedsteads.

1256. Richard Whytock. Improvements in colouring yarns or threads intended to form elements of various loom fabrics, and for crochet work and knitting.

1260. James Taylor and William Smith. Improvements in the chairs of railways.

1261. Clement Coe. Improvements in the mode or method of manufacturing druggets, bockings, pilot-cloths, blankets, or similar strong materials. A communication.

1262. Charles Little. Improvements in machinery or apparatus for the manufacture of envelopes.

1280. David Newell Brown Coffin, junior. A new and useful improvement in self-closing stop-cocks.

1282. Cyrus Curtice. A new and improved light-alarm or burglar annunciator or apparatus, to give alarm when a burglarious attempt is made to enter a room or dwelling. A communication from Edward Brown and other foreigners.

1284. Ethan Allen. An improved breech-loading fire-arm.

1292. George Hopper. Improvements in rolling and shaping metals.

1294. James Robertson. Improvements in trans-

mitting motive power in certain circumstances where reversing actions are necessary.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed June 15, 1855.

2660. Charles Frederick Stansbury.
2664. Edwin Whele.
2680. R. B. Huygens.
2681. John Paul.
2693. William Greener.

1855.

30. Louis Dominique Girard.
46. Peter Armand Lecomte de Fontainemoreau.
95. Gustav Warnecke.
96. Joseph Claudot.
124. James Webster.
248. Benjamin Goodfellow.
384. John Hyde Pidcock.
471. Benjamin Dickinson and John Platts.
679. Archibald Turner.
749. Frederick Joyce.
769. William Bennett Hays.
888. Alfred Vincent Newton.

Sealed June 19, 1855.

2710. Felix Marie Baudouin.
2735. Margaret Williams.

1855.

113. James Simkin.
603. Thomas George Shaw.
637. William MacNaught.

CONTENTS OF THIS NUMBER.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Mason and Co., Dublin; W. C. Campbell and Co., Hamburg.

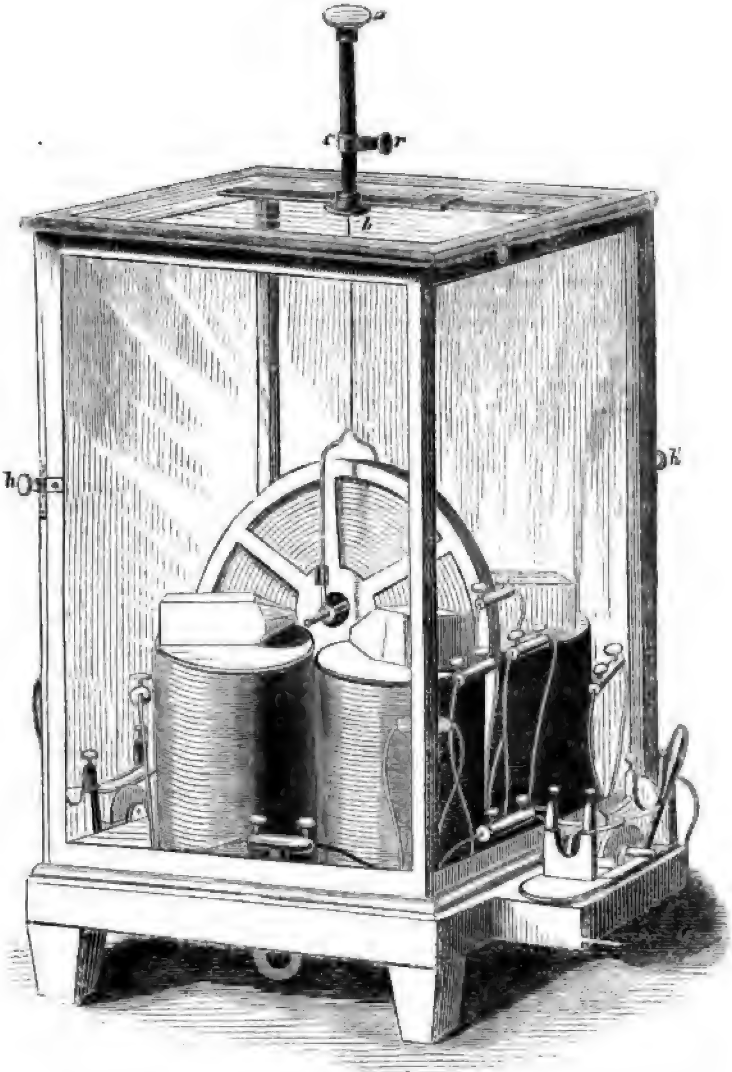
Mechanics' Magazine.

No. 1664.] SATURDAY, JUNE 30, 1855. [Price 3d. Stamped 4d.

Edited by R. A. Brooman, 166, Fleet-street.

PROFESSOR TYNDALL'S POLYMAGNET.

Fig. 8.



PROFESSOR TYNDALL'S POLYMAGNET.*

THE polymagnet was devised for the purpose of exhibiting before a class of pupils as many as possible of the phænomena of electro-magnetism and diamagnetism.

The instrument consists of an arrangement of two horse-shoe electro-magnets, a helix of covered copper wire disposed between them, and suitable means of suspension.

A section of one of the electro-magnets and its surrounding spirals is given, in fig. 1. *ab*, *cd* are two cylindrical cores of soft iron, which are united by a cross-piece of the same material, *ef*. Through the cross-piece pass the strong screws, *g* and *h*, into the cores, and by them the ends, *b* and *d*, of the cores, which are accurately planed so as to ensure perfect contact with the cross-piece, are attached to the latter. The diameter of the cores is 1·125 inch, and their distance apart from centre to centre, 4·85 inches; the cross-piece, *ef*, is drawn in proportion.

Round each core is a helix of copper wire, overspun with cotton, which was afterwards saturated with shell-lac. In winding the helix, two lengths of wire, one covered with red cotton and the other with green, were laid side by side, and coiled as a single wire. The diameter of the wire is 0·1 of an inch, and the weight of it which surrounds each limb of the magnet is 12 lbs. For all four limbs, therefore, a weight of 48 lbs is made use of.

The second electro-magnet is in every respect similar to the one just described.

Fig. 2 is a front view of a helix of covered copper wire, intended to be placed between the two electro-magnets; it has an internal diameter, *ab*, of 1 inch; an external diameter, *cd*, of 8 inches, and measures along its axis 1·15 inch. The diameter of its wire is 0·065 of an inch, and its weight is 6 lbs; it is wound so as to form a double coil, as in the case of the electro-magnets. The radial strips, and central and surrounding ring seen in the figure, are of brass, and hold the coils of the helix compactly together.

Fig. 3† represents a stout slab of mahogany which supports the apparatus. *ab*, *cd* are hollows cut in the slab to receive the cross-pieces of the two electro-magnets; from *e* to *f* the slab is cut quite through, the cross-pieces merely resting on the portions between *f* and *b*, *f* and *d*, &c. The small apertures at *x*, *x'* show where the screws enter which attach the cross-piece to the slab of wood. The central aperture at *g* shows where the pin, *g''*, of the helix, fig. 2, enters, the helix thus occupying the central portion of the board. Right and left are two projections for the reception of two current reversers, which will be described immediately. There are apertures for the reception of pins projecting from a glass case intended to cover the whole apparatus.

When the magnets and central helix are fixed in their places and looked down upon, their appearance is that represented in fig. 4; at *a* and *c* the tops of the cores are seen, the movable masses of soft iron which belong to them being removed; the two ends of the other electro-magnet bear two such masses, each formed from a parallelopiped 4·5 inches long, 2 inches wide, and 1·25 inch high, having one end bevelled off so as to render it pointed, the other end being suffered to remain flat. The distance between those movable masses may be varied, or the body to be examined may be suspended either between *surfaces* or *points*, according to the nature of the experiment. The projections of the current reversers upon the horizontal plane are seen right and left.

Simplicity and efficiency being the objects aimed at, a current reverser was devised, which fulfils these conditions. A front view of the instrument is given in fig. 5, and its horizontal projection in fig. 6. Q is the section of a quadrant of wood, which is capable of being turned by the handle, H P; *ab* is the section of a strip of brass laid on the periphery of the quadrant; *cd* is a shorter strip similarly laid on; between *b* and *c* is a gap, formed of the wood of the quadrant itself, or of a piece of ivory or glass inlaid; *s* and *s'* are two brass springs,‡ which are shown in the figure to rest upon the strips of brass, *ab* and *cd*; M, M' are two clamps secured to the wooden pillars, O and O', by screws, S, which pass up through the latter. The plan below corresponds to the section above. From *b*, fig. 6, the strip of brass crosses to *c'*, and from *c* to *b'*, both being insulated from each other at R. Supposing, then, the two clamps, M and L, to be connected with the two poles of a galvanic battery, the current entering at M would flow along the spring *s* to *b*, thence to *c'*, and finally along the spring, *s'*, to the clamp, L': in like manner the current entering at L would attain the clamp, M'. In this position of things the handle of the instrument leans to the left, as in fig. 5. If the current is to be interrupted, this is secured by setting the handle vertical; for when the handle is in this position, the spring, *s*, rests upon the non-conducting surface, *bc*, and the circuit is broken. If it be desired to send the current direct from L to L', and from M to M', this is accomplished by causing the handle to lean to the right; when this is done, both the springs, *s*, *s'*, rest upon the self-same strip of

---

* *From the Philosophical Magazine.*

† *Figs.* 3 and 4 are combined in the accompanying engravings, the parts shown in the former being marked by ticked lines in the latter. Figs. 5, 6, 7, and 8a, are reduced in size from the original.—ED. M. M.

‡ *Copper, I think, would be better than brass.*

brass, *ab*, and there is direct metallic communication between L and L, and between M and M. This reverser has been tested practically, and found very convenient. It is very similar to an instrument devised by Prof. Reusch, but simpler and more easily constructed.

Fig. 7 is a plan of the top of the glass case which surrounds the polymagnet. At C a brass tube is cemented to the glass, which is here perforated, and through the tube a rod passes, furnished at its lower extremity with a hook, to which is attached a suspending

Fig. 1.

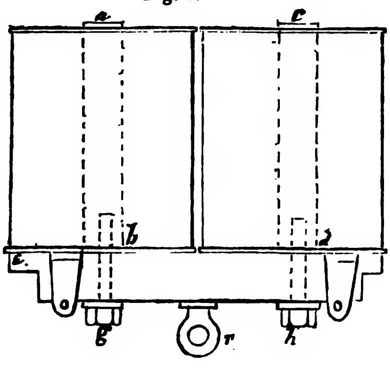
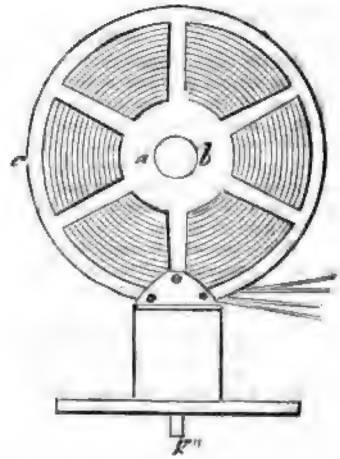
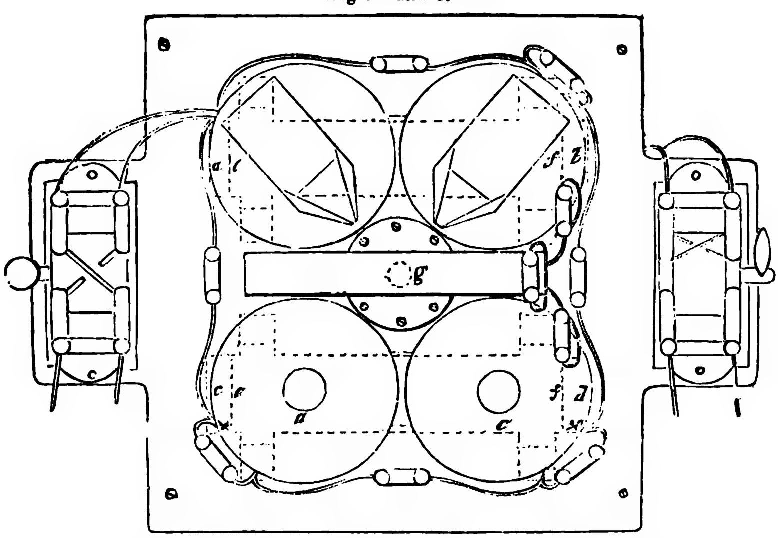


Fig. 2.



fibre. *ab* is a horizontal brass cylinder, capable of being turned on its axis by the milled head at *a*, and thus coiling a suspending fibre around a groove marked at *d*; the cylinder is also capable of sliding right and left, so that the body suspended from the fibre may be

Figs. 3 and 4.



moved laterally, and the amount of motion measured on the graduated bar above.* *a′ b′* is another horizontal suspension rod, in every respect similar to the former.

* *This arrangement, though very convenient for private research, is not necessary for lecture experiments.*

The whole instrument, surrounded by its glass case, is shown in perspective in fig. 8. The magnets are visible, with the movable masses of soft iron resting upon them; in the centre is seen the helix sketched in fig. 2, and within the helix a bismuth bar supported by several fibres of unspun silk attached to the central rod which passes through the top of the glass case. The manner of suspension of the bismuth will be understood from the drawing, certain practical artifices which suggest themselves when the drawing is attentively inspected, being introduced to facilitate the placing of the axis of the bar along the axis of the surrounding helix. The current reversers are seen *without* the case; two opposite sides of the latter can be opened by the handles, *h* and *h'*, so that free and easy access to the interior is always secured.

Experiments to be made with the Polymagnet.

1. All the experiments that are usually made with an upright electro-magnet.

2. The various portions of the instrument may with great facility be lifted separately out of the case. One of the electro-magnets being thus removed, a rope can be passed through a ring, *r*, introduced for this purpose into the cross-piece, fig. 1. Adjacent to the screws, *g* and *h*, two plates of brass are seen; these are attached to the brass reels of the helices, and by passing a pin through the holes shown in the figure, the helices are prevented from falling when the magnet is turned upside down. Attaching the rope to a hook in the ceiling, or to a strong frame made for the purpose, experiments on the lifting power of the magnet may be made.

3. While one of the magnets is suspended as last described, the other, which is of exactly the same size, can be brought up against it, the free ends of the four cores being thus in contact. The same current being sent through both magnets, we have the mutual attraction of two electro-magnets instead of the attraction of an electro-magnet for a mass of soft iron, as supposed in the last experiment. The arrangement just described is, indeed, precisely that devised by M. Pouillet in the construction of a powerful electro-magnet for the faculty of sciences at Paris. To the cross-piece of the second magnet a ring is also attached, from which weights can be suspended.

4. The cross-pieces may be removed by withdrawing the screws, *g* and *h*, and the spirals may be made use of singly with their corresponding bar-magnets. As two wires surround each coil, one of them may be used to exhibit the induced currents developed by the other. The phænomena of the extra-current may also be studied, and the remarkable effect produced by connecting the two ends of one of the wires, or the spark of the extra-current in the other, may be exhibited.

The milled head, *a*, fig. 7, can be screwed off, and the rod, *ac*, pushed downwards into the case; the helix in the centre can also be readily lifted out of its position, and removed from the glass case. We will suppose this done. The two electro-magnets alone are now within the case, and the view is uninterrupted, which would not be the case if the helix had been permitted to remain.

The fibre hanging from the groove, *d*, fig. 7, can be so arranged that any substance attached to it shall hang between the movable masses of soft iron which surmount the electro-magnets, and the same arrangement can be made for the fibre suspended from the groove, *d'*.

Fig. 5.

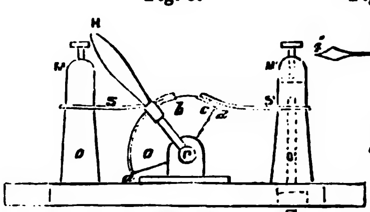


Fig. 8*a*.

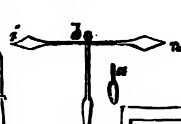


Fig. 7.

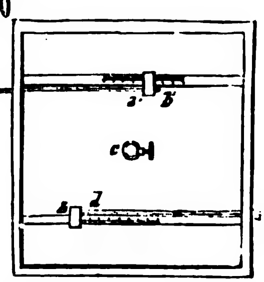
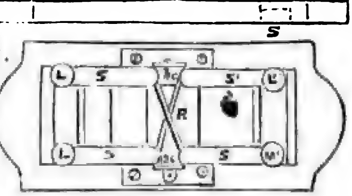


Fig. 6.



But a body suspended between the movable masses of soft iron would be hidden by these masses from the audience, and hence to render the motions of the body visible, the follow-

ing expedient was adopted:—Fig. 8*a* represents a thin index of ivory, about 4 inches long, and shaped as in the figure; from the centre depends the stem, *dc*, which is terminated by a tongs-shaped arrangement which can clasp the body to be submitted to experiment; to the right of the index a section of the little ivory pliers, by a plane passing through the stem at right angles to *i n*, is given; the stem is slit up to *a*, so as to allow of the pliers being opened to receive the body to be examined, which they then clasp in virtue of the elasticity of the ivory. The stem, *de*, is of such a length that when the body is in the centre of the space between the poles, the index, *i n*, is seen above them; and as the index follows all the motions of the body underneath, these motions are recognized by all who see the index.

5. If an ordinary magnetic bar, sufficiently feeble, be suspended between one pair of poles, and an ordinary diamagnetic bar between the other pair, on sending the same current round both magnets the index of the former sets itself parallel to the polar line, while the index of the latter sets itself perpendicular to the polar line, and thus the phænomena of magnetism and diamagnetism address the eye simultaneously.

6. In the same way, if a normal* magnetic bar be suspended between one pair of poles, and an abnormal magnetic bar between the other, the antithesis of their deportment may be made manifest. The same antithesis is exhibited when we compare a normal diamagnetic bar with an abnormal one.

7. And when between one pair of poles is suspended a normal magnetic bar, and between the other pair an abnormal diamagnetic one, the apparent identity of deportment of both bars is rendered evident at once. The same identity is shown when we compare the abnormal magnetic bar with the normal diamagnetic one.

8. Causing the points to face each other, instead of the flat ends of the poles, and observing the directions given in the paper spoken of, the curious phænomena of rotation on raising or lowering the body from between the points, first observed by M. Plücker, and explained in the paper referred to, may be exhibited.

9. To show that a bar of bismuth, suspended within a helix and acted upon by magnets, presents phænomena exactly analogous to those of soft iron, only always in opposite directions, let the flat helix be replaced between the two electro-magnets. The bar of bismuth used in experiments with the instrument now described is 6 inches long and 0·4 of an inch in diameter. Suspended so as to swing freely within the helix, its ends lie between the movable masses of iron which rest upon the electro-magnetic cores. Four poles are thus brought simultaneously to bear upon the bar of bismuth, and its action is thereby rendered both prompt and energetic. The two poles to the right of the bar must both be of the same name, and the two to the left of the bar of the opposite quality. If those to the right be both north, those to the left must be both south, and *vice versâ*. On sending a current from ten or fifteen cells round the helix, and exciting the magnets by a battery of four or five cells, the current reversers place the deflections of the bar entirely under the experimenter's control. By changing the direction of the current in the helix by means of its reverser, a change of deflection is produced; the same is effected if the polarity of the magnets be changed by the reverser which belongs to them. For a full description of all these phænomena, I must refer the reader to the paper on the nature of the diamagnetic force, already mentioned.

10. To those acquainted with what has been done of late years in diamagnetism, numerous other experiments will suggest themselves. The antithesis of two isomorphous crystals, one magnetic and the other diamagnetic, the general phænomena of magnecrystallic action, and the analogous effects produced by pressure may all be exhibited.

By placing one of the helices of the electro-magnet upon the other, a coil of double length is obtained, and two such coils may be formed from the four which we have described. For the additional expense of the iron merely, a single electro-magnet, far more powerful than either of the others, because excited by twice the quantity of coil, may be obtained.

I think it would be an improvement if the suspensions were independent of the glass case, so as to permit of the entire removal of the latter. The best way of showing the deflection of the bismuth bar within the central helix to a large audience is, to attach a long, light index to the bar itself, and permit this index to enter a French shade which will protect it sufficiently from currents of air. With this arrangement the motions are strikingly evident, and may be seen by hundreds at once. The instrument above described was constructed by Mr. Becker, of Newman-street, and its cost is about £24. It was not my intention originally to have so much wire round the electro-magnets; and the effects may

---

* For the explanation of normal and abnormal bars see a memoir "On the Nature of the Force by which bodies are repelled from the Poles of a Magnet," to be published in the forthcoming part of the *Philosophical Transactions*.

also be made manifest with a smaller central coil. I have no doubt that with 8 lbs. of wire round each limb of the electro-magnets, and a central coil weighing 4 lbs., the experiments might be exhibited to a large audience with perfect distinctness. A sensible diminution of cost would, of course, accompany this diminution of material and labour.

ON NATURE-PRINTING.

(*Concluded from page 582.*)

During the next twenty years nature-printing was but indifferently prosecuted by various persons for various purposes. Mr. Taylor, of Nottingham, as far back as 1842, printed lace, &c., specimens of which were exhibited at the Great Exhibition; and Mr. Twining, of Nottingham, in 1847, printed ferns, grasses, and plants, which were exhibited by the Botanical Society of London. He adopted the same plans as those used by Kniphof and Hoppe.

In 1847, also, Dr. Ferguson Branson commenced a series of experiments, an interesting paper upon which was read before the Society of Arts in 1851, and therein for the first time was suggested the application of that second and most important element in nature-printing which is now its essential feature—the application of the electrotype.

"I beg leave," says he, "to bring before the notice of the Society of Arts a new method of engraving plates for printing ferns, leaves, seaweeds, and other flat plants. . . Having taken in gutta-percha some impressions of ferns, the singularly beautiful manner in which the exact character of the plant was transferred to the gum suggested to me the possibility of printing from the gutta-percha itself, so as to produce on paper a *fac-simile* of the plant. That experiment partially succeeded, and curiously tested the elasticity of the substance; for the impression remained uninjured, after being subjected to the great pressure of a copper-plate roller. I say that it *partially* succeeded; for the printer found it utterly impossible so thoroughly to cleanse the ink from the margin around the impression, as not when printed to leave a dirty stain on the paper. The impressions thus produced were very accurate; but the process was valueless as regards multiplication of the prints."

It then occurred to Dr. Branson that an electrotype copy would obviate the difficulty.

He afterwards stated that he abandoned the process of electrotyping in consequence of his finding it tedious, troublesome, and costly to produce large plates. Having occasion, however, to get an article cast in brass, he was astonished at the beautiful manner in which the form of the model was reproduced in the metal. He determined, therefore, to have a cast taken in brass from a gutta-percha mould of ferns, and was much gratified to see the impression rendered almost as minutely as by the electrotype process;* but, however curious his individual specimens, the process produced no practical result.

In 1849, Professor Leydolt, of the Imperial Polytechnic Institute at Vienna, availed himself of the resources of the Imperial printing-office to carry into execution a new method he had conceived of representing agates and other quartzose minerals in a manner true to nature. Professor Leydolt had occupied himself for a considerable period in examining the origin and composition of these interesting objects in geology. In the course of his experiments and investigations he had occasion to expose them to the action of fluoric acid, when he found, in the case of an agate, that many of the concentric scales were totally unchanged, while others, to a great extent, decomposed by the acid, appeared as hollows between the unaltered scales. It occurred to Leydolt that the surfaces of bodies thus corroded might be printed from, and copies multiplied with the greatest facility.

The simplest mode for obtaining printed copies is to take an impression direct from the stone itself. The surface after having been etched is well washed with dilute hydrochloric acid and dried; then carefully blackened with printer's ink. By placing a leaf of paper† upon it, and by pressing it down upon every portion of the etched or corroded surface with a burnisher, an impression is obtained, representing the crystallised rhomboidal quartz *black*, and the weaker parts that have been decomposed by the action of the acid *white*. It requires but a small quantity of ink—and particular care must be exercised in the rubbing down of the impression. This mode is good as far as it goes—but it is slow and uncertain—incurring a certain amount of risk, owing to the brittle nature of the object; and the effect produced is not altogether correct, since it represents those portions black that should be white, and those white that should be black.

* The casting in brass is a very interesting experiment, but its results cannot be compared with the production of the electrotype.

† India paper and chalk paper are the best adapted for the purpose.

The stone is not sufficiently strong to be subjected to the action of a printing-press; an exact *fac-simile* cast, therefore, of it must be obtained, and in such a form as can be printed from. To effect this, the surface of any such stone (previously etched by corrosion) must be extended by imbedding it in any plastic composition that will yield a perfectly flat and smooth surface, so that the surrounding surface of the plastic composition will be exactly level with the surface of the etched stone; all that is necessary now is to prepare the electrotype apparatus, by which a perfect *fac-simile* is produced, representing the agate impressed, as it were, into a polished plate of copper. This forms the printing-plate. The ink in this case, as opposed to the mode before referred to, is not applied upon the surface, but in the depressions caused by the action of the acid on the weaker parts; the paper is forced into these depressions in the operation of printing, which results in producing an impression in relief—a feature that is rather peculiar to the process, as the raised appearance, especially in the case of plants, adds very much to their effect.

The impressions printed in this latter manner present far more beautiful and natural representations, since the crystallised quartz are represented *white*, while the decomposed parts appear *black*.

Professor Leydolt, however, suggests that some corroded stones are better suited sometimes for one method of representation than the other; and attention should be paid to this while the stones are being exposed to the action of the acid. He considers that important advantages will result to science from the perfect faithfulness of such representations, and from the facility and inconsiderable expense of their production.

Other objects in geology — such as the fossil remains of fishes, plants, and other organic remains—in some cases can be, and have been, copied with unmistakable resemblance to the original.

It is not clear who may have suggested the possibility of creating impressions of these last-named objects, but one thing is beyond a doubt, that the production of them was left entirely to the judgment of Andrew Worring, as was also the case in the production of the agates and other stones.

In operating upon this class of objects, it is desirable that the original should be as flat as possible, as the flatter the general surface is, the more successful will be the effect produced.

A mould in the first place is taken with gelatine or liquid gutta-percha, the elasticity of which materials are favourable for flattening the mould without distortion when separated from the original—a mode that is to be preferred to depositing copper direct upon them, since it is very much more easily manipulated, and without the slightest risk of damaging the originals, owing to the absence of pressure.

This gelatine or gutta-percha mould is rendered metallic or conducting in the usual way by the application of plumbago, and copper is deposited until of sufficient thickness to form a printing-plate.

In 1852, Mr. Aitken, of Birmingham, followed the footsteps of Kyhl in various experiments made by him in Britannia metal. He took impressions of lace, skeleton-leaves, feathers, &c., in Britannia metal, for the purpose of ornamentation, in the same way as Kyhl is said to have done in articles of silver. About this period Dr. Branson again made experiments, and endeavoured to bring nature-printing into practical operation. He too tried impressions on Britannia metal, not altogether with the view of printing direct from such plates, desirable as it would be to dispense with the operation of taking casts—but of transferring impressions to stone; and after printing an impression on some neutral tint, to resort to colouring by hand. (Specimens of this method were lying on the table of the Royal Institution during the delivery of Mr. Bradbury's lecture; but, on examination, would not bear comparison with the productions of the present time.)

In the Imperial Printing-office of Vienna, the first application of taking impressions of lace on plates of metal, by means of rollers, took place in the month of May, 1852:* it originated in the Minister of the Interior, Baumgartner, having received specimens from London, which so much attracted the attention of the Chief Director, that he determined to produce others like them. This led to their using gutta-percha in the same way that Dr. Branson had used it; but finding this material did not possess altogether the necessary properties, the experience of Andrew Worring induced him to substitute lead, which was attended with remarkable success. Professor Haidinger, on seeing specimens of these laces, and learning the means by which they had been obtained, proposed the application of the process to plants. The results of these experiments,† as well as those of Professor Leydolt above referred to, appeared in the fifth volume of Memoirs of the Imperial Academy, published at Vienna in 1850.

* The Austrian patent was taken out on the 12th October, 1853, in the name of Andrew Worring.

† These consisted of specimens of lace, leaves, plants, mosses, serpent-skins, the wing of a bat, agates, fossils, and petrifactions; and it is somewhat curious that these examples were similar in character to those chosen by Kyhl.

Up to this time, however, in England, notwithstanding the above-mentioned experiments, the discovery had not assumed any practical form; but there is little doubt that if any of these persons had had the requisite means and appliances, it would have been brought to perfection earlier. These consist mainly in the precipitation of metals upon moulds or matrixes by means of electro-galvanic agency.

Nature-printing owes its present success to the electrotype, which was then, and even at the present time is, the only means by which *faithful* copies can be taken of those delicate fibrous details that are furnished in the examples of the impressions of botanical and other figures in metal. It may be said to be owing to the extensive scale upon which the process of the electrotype is conducted in the Imperial establishment, that Worring was enabled to render the process of nature-printing practically available as a printing art.

The deposition of metals by galvanic agency, though long known and practised in England, has been considered more as a *scientific* than a *practical* mode of casting; and it is only within the last few years that its value in its manufacturing capabilities has been properly understood. Up to within a short time it has been found uncertain, difficult, tedious, expensive, and requiring great length of time to obtain adequate results from it; but Mr. Bradbury stated that he had for the last two years devoted his energies to overcome these difficulties, and that his experiments had been attended with many practical advantages in the art of printing. On the table before him he had a small electrotype apparatus, by which was produced a perfect electrotype cast of an impressed metal plate before the audience in half an hour.* He stated, that one of his experiments had been crowned with such success that he had reduced the operation of the battery and the decomposition trough to so rapid and certain a result, as to be able to duplicate the woodcuts contained in a number of the *Illustrated London News*, no matter what their number or size, in the short space of twelve hours (ready in every respect for the press), which he stated as his belief was one of the greatest practical accomplishments that had ever been made in any country in this branch of science; the value of which to the journal in question will be best understood when it is known, that without *this* or other means (not yet discovered), the production of the requisite number of copies in time for publication would be a mechanical impossibility (so extensive is its circulation), since from *one* set of engravings there is a limit to the number of impressions that can be printed from *one* machine in a given time.

The mode of printing these electrotype* plates of plants is the same as in ordinary copper-plate printing, where the impression is produced by passing the inked plate with the sheet of paper laid upon it through a pair of rollers, one of which is covered with four or five thicknesses of blanketing, which causes the peculiar raised or embossed appearance of the impression.

In such cases, where there are three, four, or more colours, for instance—as in flowering plants having stems, roots, leaves, and flowers—the plan adopted in the inking of the plate is to apply the darkest colour first, which generally happens to be the roots—the superfluous colour is cleaned off—the next darkest colour, such as perhaps the colour of the stems, is then applied—the superfluous colour of which is also cleared off; this mode is continued until every part of the plant in the copper-plate has received its right colour. In this state, before the plate is printed, the colours in the different parts of the copper look as if the plant was imbedded in copper. By putting the darkest colour in at the beginning, there is less chance of smearing the lighter ones; the printer, too, is not only able by this means to blend one colour into another, but to print all the colours at one single impression.

The *first* practical application of nature-printing for illustrating a botanical work, and which has been attended with considerable success, is Chevalier Von Heufler's work on the Mosses,† collected from the Valley of Arpasch, in Transylvania; the *second* (the *first in this country*), is the "Ferns of Great Britain and Ireland," in course of publication, under the editorship of Dr. Lindley, and printed by Messrs. Bradbury and Evans. Ferns, by their peculiar structure and general flatness, are especially adapted to develope the capabilities of the process, and there is no race of plants where minute accuracy in delineation is of more vital importance than the ferns; in the distinction of which, the form of indentations, general outline, the exact manner in which repeated subdivision is effected, and most especially the distribution of veins scarcely

* In the afterpart of the evening Mr. Bradbury *succeeded* in producing thin electro-plates of *impressed plates* in five minutes.

* The copper deposited upon moulds by electro-galvanic agency, is precipitated in such inconceivably small atoms, that the defects previously referred to in the surface of the lead plate, are also *faithfully* copied, but the surface of copper (unlike that of lead) will allow of these defects being removed by the aid of the burnisher, and a polished surface preserved.

† "Specimen Floræ Cryptogamæ vallis Arpasch Carpatæ Transylvani." Conscripsit Ludovicus Eques de Heufler. Vienna, 1853. Imp. folio.

visible to the naked eye, play the most important part. To express such facts with the necessary accuracy, the art of a Talbot or a Daguerre would have been insufficient until nature-printing was brought to its present state of perfection.

Mr. Bradbury then adverted to the ingenious and beautiful productions of Felix Abate, of Naples. His nature-representations consist of sections of wood, in which the grain is admirably represented. He terms his peculiar process Thermography, or the art of printing by heat. The process consists in wetting slightly the surface of the wood of which *fac-similes* are to be made, with any diluted acid or alkali, and then taking an impression upon paper, or calico, or white wood; the impression is quite invisible, but by exposing it for a few instants to a strong heat, the impression appears in a more or less deep tone, according to the strength of the acid or alkali. In this way every gradation of brown from maple to walnut is produced; but for some woods which have a peculiar colour, the paper, &c., is to be coloured, either before or after the impression, according to the lightest shades of the wood. Abate, in his manipulations, also employs the ordinary dyeing process.

It is to be hoped that Abate's process may become alike useful to the natural sciences and the decorative arts.

Mr. Bradbury stated, in conclusion, that we are indebted to—

Kniphof, for the application of the process in its rude state;

Kyhl, for having first made use of steel rollers;

Branson, for the suggestion of the electrotype;

Leydolt, for the remarkable results he obtained in the representation of flat objects of mineralogy, such as agates, fossils, and petrifactions;

Haidinger, for having promptly suggested the impression of a plant into a plate of metal at the very time the *modus operandi* had been provided;

Abate, for its application to the representation of different sorts of ornamental woods on woven fabrics, paper, and plain wood;

Worring, of the Imperial Printing-office, Vienna,* for his practical services in carrying out the plans of Leydolt and Haidinger.

Nature-printing may be considered as still in its infancy; but the results already obtained in its application encourage us to expect from continued efforts such further improvements as will place it not least among the printing arts.

Since the foregoing portion of this article has been in type, the following interesting communication from Felix Abate, of Naples, has appeared in the *Journal* of the Society of Arts:

"In the first communication I had the honour to make to the Society of Arts * on this invention," says the author, "I described two different processes which I employ for the purpose; the one of them depending upon the effects produced by the joint action of acids and heat upon vegetable substances; and the other, a more complex one, as it comprises the different processes upon which the art of dyeing and printing textile materials rests. Both these processes, by different means, produce nearly identical results.

"In order to bring my invention to practical utility, and make it serve the various purposes of the decorative arts to which it may be applied, I thought it was requisite that the nature-prints should be made in an endless way, as is done for woven stuffs, which, besides being an essential point for the application of the invention to house decoration, is undoubtedly the most suitable way to obtain that cheapness of manufacture which is the first condition for the general adoption and success of every new invention. I had then to choose between the two above-mentioned processes to which of them I should give the preference, and I found the second one to be in many respects superior to the other.

"A machine, constructed upon the principle of the cylinder printing-machine, was then requisite for my purpose, in which the printing cylinder should be made, either solid or veneered, of the wood from which impressions are intended to be taken. However, this contrivance, which in the last quarter of a century has brought such important results in the art of printing textile manufacture, could not be applied to the above purpose without meeting with peculiar difficulties, against which, in fact, I had long to contend. The most serious of these difficulties were two—the one was, in contriving a self-acting apparatus for feeding the cylinder with the requisite fluid, at such a constant and controllable degree as experience has found suitable in the printing with flat blocks by manual labour; the other was in the discovery of some new means to dispense with the bathing of the printed stuff either in a mordant or in a colouring bath, whenever paper is the stuff to be printed on; as unsized paper, which is

* It is gratifying to know that the services of this gentleman were recognised by his sovereign, who munificently rewarded him with a gift, and likewise the order of merit.

* See *Mech. Mag.*, vol. lxi., p. 4. (No. 1612.)

the most suitable for the purpose, will not bear, in a wet state, being drawn through the machine. Besides, it was desirable that the different successive operations which are performed in printing textile manufactures should be done at one time and in a single revolution of the machine, in order to reduce the cost of manufacture to its minimum.

"I have made the cylinder-feeding apparatus in the shape of a trough, in which the wetting fluid is kept at a constant level through a reservoir from above and a discharge from below. A cloth, one side of which is immersed in the liquid, acts by capillary attraction as a syphon, and communicates the liquid in a continuous supply to the revolving cylinder with which it is in contact from the other side; an elastic cushion placed between the trough and the cloth securing the requisite equality of pressure of the latter upon the cylinder, while a pair of screws pressing on the back of the trough serve to regulate at will the degree of such pressure. This apparatus answers the purpose perfectly well.

"In order to dispense with the bathing of the printed stuff, I had recourse to the metallic sulphurets, which are known to produce more lasting colours than the vegetable dyeing stuffs. Therefore I contrived to obtain the required effects by using for the printing menstruum any of those metallic salts, such as copper, iron, &c., which by the action of hydrosulphuretted acid or alkalies are precipitated in the state of metallic coloured sulphurets; I use such re-agents in the gaseous form, such as hydrosulphuretted ammoniacal gas. The printed stuff is made to pass direct from the cylinder after it is printed, through a box, which is kept constantly supplied with a current of gas; it comes out of the box completely finished; then, passing through a stove kept at a moderate heat, dries—and lastly winds itself round a reel, ready for sale. In this way the thorough printing of the stuff in a single revolution of the machine is performed.

"The principle of using the hydrosulphurets in the gaseous state in the art of dyeing, which, as far as my knowledge goes, has never been done before, is of considerable importance in that branch of manufacture, as it produces the most satisfactory results with the greatest convenience and cheapness, while it entirely obviates the evil arising from the noxious evaporations of the hydrosulphurets when used in the liquid state and left to evaporate in the open air."

APPARATUS FOR CORRECTING THE VARIATIONS OF SHIPS' COMPASSES.

Lieutenant Friend, of the royal navy, and Mr. Browning, philosophical instrument maker, of the Minories, have patented an invention which has for its object the construction and use of an apparatus denominated a "pelorus" for determining the amount of magnetic aberration occasioned by local attraction in ships or vessels of every description, by the use of which apparatus, together with a certain improved binnacle compass, the true course of a ship or vessel is to be from time to time accurately ascertained.

The combined apparatus may be described as follows:

First. A metallic ring is divided into degrees and parts of the circle commencing at zero,—this point being placed, when the instrument is used, to represent, or coincide with the head of the vessel,—and the divisions are continued from zero on each side to 180°.

Second. Within the ring before-mentioned, and moving freely upon its centre, is a metal bar furnished with sight vanes for the purpose of taking bearings. This bar is also provided with verniers at its extremities for reading off the points indicated upon the metallic ring.

Third. Moving upon the same pivot as the before-mentioned parts, and beneath the metal bar, is placed a disc or card, similar in appearance to that of an azimuth compass, but consisting of a metallic disc without any magnetic needle, and having a silvered or other rim divided into degrees and parts of the circle in the ordinary manner. The divisions may be read off from the vernier at each end of the moveable bar, but within the sight vanes, and also at or from the zero of the ring. The disc or card is fixed to the bar at any required point when necessary, by a screw, or by any other means.

The whole of the apparatus may be suspended by gymbals in a square box, and balanced by a weight, to keep it in a horizontal position, in the ordinary manner, and it may be adjusted by screws at the supporting points on either side of the box.

Fourth. A moveable index, similar to the hand of a clock, is attached to the centre, and works upon the upper surface or face of the card of the ordinary binnacle compass, which card is to be divided with a degree of accuracy corresponding to that of the "pelorus."

The "pelorus," should be securely fixed in an eligible position upon any firm sup-

port or pedestal in the neighbourhood of the binnacle, and elevated sufficiently to command a view of the horizon, having the zero division in a line with or parallel to the keel. When properly adjusted in this position the instrument is complete.

The inventors explain the use of the instrument as follows: "To find the local attraction of a ship or vessel before leaving port, bring into a line with the sight vanes the most distant object of which you can obtain the view, and while they are in that position set the moveable disc or card so that it may correspond at the zero with the binnacle compass, and screw it tight, still retaining the view through the sight vanes of the distant object before-mentioned. Swing the vessel completely round, preserving her local position of centre as much as possible. At every point of the compass observe the direction of the ship's head as exhibited respectively by the 'pelorus,' and binnacle compass. The difference between them will be the amount of local attraction at the various points of comparison. In using the 'pelorus' at sea it is necessary to observe that the local attraction will vary with the ship's change of place on the globe:—the ordinary corrections will therefore be chiefly made by means of amplitudes and azimuths of the heavenly bodies. If by amplitude, take from the table, expressly prepared for the purpose, the anticipated bearing of the body to be observed, which point place upon the moveable disc or card coincident with the vernier or mark immediately within the sight vane, and screw the disc firmly to the bar by means of the nut at the centre. Take the amplitude in the usual way, and at the same moment let the direction of the ship's head be observed by the binnacle compass, and that of the pelorus from the card at the zero;—their difference will be the gross amount of all magnetic errors and will exhibit the ship's true course. If the variation of the compass be known and deducted from the gross amount of errors the difference will be the local attraction in that course. Proceed in the same manner with the azimuth, except that a quadrant will be required, which must be set to the altitude at which it is intended the star should be observed. If the true bearing of the heavenly body cannot be conveniently ascertained before the observation, as the object may be rising or setting, set the disc or card due east or west to the vernier within the sight vane; take the observation as before, noting the position of the ship's head at the zero, to which apply the difference of the true bearing from the east or west point when found. Thus, if the object be taken with the card at west, ten degrees north, the true bearing being to the right hand of that which was assumed, the difference must be applied at the point shown at zero. Thus:—An azimuth taken with the card at west gave the ship's head by pelorus south, twenty degrees east, the star or sun's true bearing in altitude was found to be west, ten degrees north, which being to the right hand must be applied, as before observed, to the point given at zero, making the true position of the ship's head south, ten degrees east."

COLLODION PHOTOGRAPHS ON METAL, STONE, &c.

An invention which consists in fixing, vitrifying, and colouring photographic images, taken by the collodion process upon enamel, metal, stone, porcelain, glass, china, and all kinds of earthenware, has recently been patented in this country.

The process is described as follows. Upon a plate of glass is poured a composition consisting of rectified sulphuric ether, rectified alcohol, gun cotton, and hydrate of ammonia. After this has been left to dry for a few seconds the plate is plunged in a solution composed of distilled water, crystallized nitrate of silver, and rectified alcohol, with or without a solvent. The plate is then ready to receive the photographic image in the usual manner, after which it is introduced into a bath composed of filtered water, sulphate of iron, acetic acid, and sulphuric acid. After the proof has been washed several times with fresh water it is plunged into a bath composed of cyanide of potassium and distilled water, and then submitted to the action of a solution of bi-chloride of mercury, hydrochloric acid, and distilled water. This operation being terminated, a very sharp permanent proof is obtained, which may be separated from the glass upon which it has been made by plunging it for a few seconds into water, and taking it off with blotting paper. This image may be applied to a surface of metal, glass, &c., of any form, by means of a thin solution of gum or other adhesive matter. It is then submitted to the heat of a furnace, like those employed in the porcelain manufacture, the temperature of which must be varied according to the fusibility of the substances employed. On leaving the furnace the image is vitrified. When hard substances are employed, such as iron, steel, &c., it is necessary to cover them with vitrifiable colours, in order to ensure the perfect incorporation or incrustation of the picture or image. When the images are to be coloured it is merely necessary to apply the vitrifiable colours by flat tints, &c. The colours may be employed in a state of

powder, or mixed with spirits of turpentine, lavender, &c.

PARIS EXHIBITION.

THE following law for protecting inventions and designs exhibited at the Paris Exhibition has been enacted by the Imperial Government of France.

Clause 1. Any person, whether Frenchman or foreigner, who is the author or inventor of a discovery or invention capable of being patented (according to the provisions of the law of July 5, 1844), or of a design capable of registration (agreeably to the law of March 18, 1806), or the representatives of such person may, if admitted to the Universal Exhibition, obtain from the imperial commission of the exhibition a descriptive certificate (*certificat descriptif*) of the article exhibited.

The application for such certificate must be made within one month from the opening of the exhibition, at latest.

Clause 2. The same rights and privileges are conferred by this certificate as would be conferred by a patent, and such rights and privileges date from the day on which the article was admitted by the local committee of the exhibition to the 1st May, 1856 (even when the date of such admission happens to be prior to the publication of the present law), and without prejudice to any patent which the exhibitor might take out, or any design which he might register before the expiration of the said period.

Clause 3. The application for a certificate is to be accompanied by an exact description of the article to be protected, and a drawing, if necessary.

These applications, together with the decisions of the imperial commission thereon, are to be entered in a special register, which is to be afterwards lodged at the office of the minister of agriculture, commerce, and public works. The said certificates are to be issued gratuitously.

THE SMOKE QUESTION.

A digest of the information obtained with regard to the operation of the inventions for the consumption of smoke, by the General Board of Health, has been laid before Parliament by command of her Majesty. The following are submitted as conclusions deduced from the evidence obtained:—1. That the emission of smoke is the effect of imperfect combustion, being always attended with waste of fuel. 2. That the fuel wasted is not only the visible smoke, or unburnt carbon, but a larger portion in the form of gas, both common coal or carburetted hydrogen gas, and the deadly compound known as carbonic oxide, which is only half-burnt carbon, containing one equivalent of carbon to one of oxygen. 3. That the chief impediment to the prevention of smoke in factories is the insufficient boiler surface in proportion to the steam required, a deficiency which occasions waste in two ways —by the escape of heat up the chimney and by the necessity of over-firing. 4. That ordinary furnace makers are ignorant of scientific principles, and guided by empirical rules. 5. That many persons have, in spite of all difficulties, succeeded in entirely preventing the escape of visible smoke, and many others reduced the time of its emission. 6. That experience disproves the truth of the vulgar allegation, that the prevention of smoke must occasion increased difficulty in getting up and maintaining steam. 7. That successful modes of preventing smoke, if there be proper boiler surface, may be adopted without infringing any patent rights, the methods in question not having been patented, or the patents having expired. 8. That such is the obstinacy of practical men, and their adherence to the old beaten track, that compulsion by law is necessary to abate the smoke nuisance, to save the manufacturers thereby from heavy unnecessary expense, and to save millions' worth of fuel a year. 9. That the reduction of smoke to a *minimum* amount may be effected with comparative ease, and without the heavy expenses that would be entailed on factory owners by the absolute prohibition of smoke. That the enforcement of anti-smoke regulations would be best effected by the appointment of watch constables. 11. That great facility for the prevention of smoke would be afforded by the publication of inventions for its prevention, by which those interested might be instructed what to do without infringement of patents; and 12. That great facilities would also be afforded by the appointment of qualified officers, not connected with any patentee or boiler manufacturer, to superintend the police employed to suppress the nuisance of smoke, and to advise owners of furnaces how best to observe the law and to report upon its infringement. In the report of the Board of Health before us, among other inventions noticed, the substitution of French, Belgian, or American stoves for common kitchen ranges is strongly recommended as combining economy with the prevention of smoke, and for common domestic fires the admirable fireplace recently invented by Dr. Arnott, and described at length in a recent number of the *Quarterly Review*, is probably, in the opinion of the Board, the improvement most likely to suit English habits and feelings. The prin-

ciple of the fireplace is that of supplying the fresh fuel at the bottom, instead of heaping it on the top of the fire. The coal is in a box nearly air-tight below the fire; the tar vapours and gases produced by the decomposition of the coal pass through the incandescent fuel above, and burn on reaching the air, while fresh fuel is supplied by pushing up the coal from below. The draught is regulated by a single valve, and the useless escape of heated air up the chimney diminished. The fire burns quite free from smoke, the burnt air is safely carried away, and fuel economized. The invention may be easily adapted to existing fireplaces. The use of gas (alone, or combined with coke), is suggested as an eventually economical, though primarily dear source of heat.—*Times.*

NEW RAW MATERIAL FOR PAPER.

BY A PAPER MAKER.

In the *Times* of a few months back there appeared to the eye a most important piece of intelligence, printed in leader type, and in a conspicuous position. Yet it was neither the capture of Cronstadt, nor yet of Sebastopol, but only an announcement that "my lords" had directed the examination of a material for paper (having taken some months to go through the process), and considered it to be a material well adapted for the purpose.

We venture to say that not a man of intelligence and practical acquaintance with the manufacture read the paragraph that did not smile at the whole affair. Do dyers and calico printers want information from "my lords" of any treasury but that of their own unrestricted enterprise, as to what new materials, in the absence or scarcity of old ones, will be better or cheaper?

If anything proved how thoroughly an important manufacture like that of paper was coddled, swathed, and bandaged by Government interference, it is this looking to any Government whatever for information and assistance. Let the paper trade be let alone from the wretched interference of pettifogging regulations, and it will soon be found that paper can be made of many new materials, that the staple of intellectual bread is not dependent on rags alone. There is no need to do more than inquire what our countrymen in Canada, and millions speaking the same language in the United States, are doing in the same manufacture, and under the same disadvantages as to rags. There, paper, especially the coarse kind, is made of materials abundant and plentiful in the extreme, but never thought of in England. We speak from personal observation when we say that the manufacture is fifty years in advance of our own all over the United States. We have seen mills in the remotest situations, worked by humble but intelligent capitalists, and turning out their paper by tons per week, coarse and brown, but well adapted for its purposes; and all made of materials, three-quarters of which were the fibres of the district. These were Indian corn stalks, flax-straw, hay, wheat-straw, or old and unserviceable woollen rags. We saw even the reeds of the swamp converted, on one occasion, into a fair white paper. All these materials, which were better adapted for coarse paper, relieved the limited stock for the finer kinds, and moderated the pressure felt for want of them. On one occasion we witnessed, with amazement almost as great as if we had been excisemen, the buyer of paper actually wait till it was made, and take it off in his cart when made, instead of putting up at a neighbouring inn, and waiting the venerable twenty-four hours till it was charged with duty, and the twelve hours after charging before it could be touched. Like army stores at Balaklava it was badly wanted, but unlike the stores there and the paper here it was delivered at once.

As a proof of the superior economy of freedom in this great manufacture, in Canada and the United States, we may observe that all paper of the coarser kind is sold at a price considerably below that paid here, less the duty. Labour is 50 per cent. dearer; fuel, machinery, insurance, all considerably so, but then the trade is free to work out its own resources. New material, indeed! What sensible paper maker would make an experiment that must cost him 100 to 150 per cent. on the material, which may or may not answer? What if some fine morning his paper is returned, will the duty be returned too? Alas, no! from that financial bourne such travellers never return. If it is an article of large consumption, and his discovery has lowered the price 50 per cent. on the natural cost, there is still the crushing duty to meet, increasing in proportion as the price is lowered. All experiments must commence with low qualities, and these pay the heaviest duty in proportion to the cost. It is therefore a practical impossibility for the paper manufacture to advance with the age so long as it has fiscal burdens to impede it. It appears to be reserved for Great Britain alone, of all the nations of the earth, to exhibit the combination of a free government and taxes on paper. How long is a state of things so dishonourable to continue?—*Gazette of the Association for the Repeal of Taxes on Knowledge.*

ANDRAUD'S SCIENTIFIC DRAMA.

At a time when the drama is perishing of exhaustion, M. Andraud has conceived the notion of imparting to it renewed vigour, by calling in the aid of science—of those inventions in which the marvellous, so much sought after by the ancient epic poets, is found. By the publication of *Galvani*, a play in five acts, M. Andraud has opened up the way, and we hope that his example may be followed by others. Our readers would perhaps arrive more readily at M. Andraud's ideas by the perusal of an extract from the preface of his new work.

"I wished," says he, "in this play of *Galvani*, to press into the service of the stage, electricity, considered in its most elevated point of view and in its boldest acceptation. The undertaking was not without difficulty. The scheme of depicting the calm life of an aged physician, engaged in his silent anatomical researches, and placed by chance on the track of a great discovery, appeared but ill adapted to realize the exciting catastrophes of theatrical representation. I felt that the Galvani, such as I had conceived him, required such a background as would bring forward in prominent relief his thoughts and characteristics. I therefore cast him in the midst of the revolutionary blaze which had at that time broken out in Italy, and there the pale and sombre figure suddenly appeared glowing with light and animation.

"The following work is the first and experimental product of the alliance which I have sought to effect between science, properly so called, and the drama; and I trust that the attempt may find an excuse in its object, which is, if possible, to enlarge the sphere of the dramatist's art."

"Up to the present time, dramatic authorship has drawn its resources from the wealthy storehouse of the human passions. The vices and follies, the virtues and crimes of mankind have always been and may always be their principal domain, but they need not be exclusively so. The infusion of a little new blood into the veins of the drama would perhaps do no harm. Why not add to those rich themes of interest which the stage already possesses, the depicting of the marvellous facts of science, or the incidents which have accompanied the grand discoveries of genius; and thus, by making them popular, render them more fruitful. We have not, however, the unwise notion of striving to place the Theatre in competition with the University; but it appeared to us that the flowers of science, hitherto cultivated beneath the chill shade and on the cold fields of the schools, might acquire a more luxuriant growth and produce fairer blossoms, if they were exposed to the glowing sunshine of human passions. The heart influenced by emotion, and the penetrating mind are nearly allied.

"If public opinion should receive this experiment favourably, I feel convinced that there is no subject, however dry it may seem, which might not some day or other be transferred from the arena of the schools to that of the theatre. The pith of the dramatic poet's labour would be in the personification of science by one of its most celebrated representatives — one who had suffered most for her cause. Thus, for example, should a poet seek to dramatize *Mechanics*, a subject which appears at first sight so foreign to the emotions of the stage? Let him call his work *Archimedes*, and he would have the richest topic that could be met with. What finer subject could there be than the struggle of this man, who, with no other weapons than scientific inventions, kept at bay for so many years the fleets and armies of haughty Rome, and perished, at last, absorbed in one of his sublime meditations!"—T., *in L'Invention.*

ATTEMPTS TO SOUND NIAGARA FALLS.

The gentleman who has been trying the experiment of sounding the river below Niagara Falls, writes as follows: "Another attempt was made with a similar iron, of about 40 lb. weight, attached to a No. 11 wire, all freely suspended, so as not to impede the fall of the weight. I then let the weight fall from the bridge, a height of 225 feet. It struck the surface fairly, with the point down, must have sunk to some depth, but was not longer out of sight than about one second, when it made its appearance again on the surface, about 100 feet down the stream, and skipped along like a chip, until it was checked by the wire. We then commenced hauling in slowly, which made the iron bound like a ball, when a cake of ice struck it, and ended the sport. I am satisfied that no metal has sufficient specific gravity to pierce that current, even with a momentum acquired by a fall of 225 feet. The velocity of the iron when striking must have been equal to 124 feet per second; and, consequently, its momentum near 5,000 lb. Its surface opposed to the current was about 50 superficial inches. This will give an idea of the strength of that current, and at the same time hint at the Titan forces that have been at work to scoop out the bed of the Niagara river."—*Athenæum.*

SPECIFICATIONS OF PATENTS RECENTLY FILED.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in the manufacture of palm-leaf hats and carcases for hats.* (A communication.) Patent dated December 2, 1854. (No. 2541.)

Claim.—"Splitting palm tree leaves into two parts in their thickness and withdrawing from the inner surface the pith or marrow, and the application of the leaf so treated to the manufacture of hats and tissues, and to carcases for mounting silk and felt hats."

MAUDSLAY, JOSEPH, of Westminster-road, Lambeth, Surrey, engineer. *An improvement in ordnance.* Patent dated December 2, 1854. (No. 2542.)

The gun described by the inventor is so made at the breech-end as to allow of an oblong aperture through the side, sufficiently large to receive a breech-piece or charge-chamber which rests on two pivots so placed as to keep it balanced, and which enables the chamber to be easily moved round sideways by a rack and pinion, or by other suitable means, so that the open end of the chamber may receive the powder and shot and be then returned to its position for firing. This chamber is also moved forward into close contact with the body of the gun, in order to prevent escape and consequent loss of effect in the discharge, by means of a powerful screw or wedge.

DOWLING, EDWARD, of Little Queen-street, Middlesex, scale maker. *Improvements in weighing machines and in their application to implements of transport.* Patent dated December 2, 1854. (No. 2543.)

The inventor combines the lever weighing-machine or steelyard, with the ordinary sack-barrow, by which means a considerable weight of goods may be weighed without the necessity of carrying any large amount of counter balance weights, the several parts of the machine being so constructed as to collapse or fold up to permit the barrow to be used for its ordinary purpose, or so as to be altogether removed from the barrow.

STRONG, HENRY, of Ramsgate, Kent, timber-merchant. *Improvements in the prevention of "back smoke" in chimneys.* Patent dated December 2, 1854. (No. 2544.)

Claim.—The application and use of valves or doors, placed on the top of a chimney, and opened or closed by persons in-doors, by means of a wire or chain passing down the interior of the chimney to a convenient fastening near the fire-place.

SHAW, ROBERT, of Portlaw, Waterford, Ireland, cotton-spinner and manufacturer. *Certain improvements in looms for weaving.* Patent dated December 4, 1854. (No. 2546.)

This invention consists in certain improved combinations of machinery by means of which the warp in power looms is released or allowed to unroll off the warp beam as it is woven.

BENTALL, EDWARD HAMMOND, of Heybridge, Essex, ironfounder. *An improved construction of locomotive steam-engine.* Patent dated December 4, 1854. (No. 2550.)

The inventor adopts an arrangement of parts which cannot well be described without the aid of engravings, (which we shall probably give hereafter) his object being to avoid considerable vibration in the framework when the engine is in action; he also applies to the framework an adjustable prop which, with the travelling wheels, supports the engine when it is at work.

PORRITT, JAMES, of Stubbin-vale-mill, near Ramsbottom, Lancaster, manufacturer. *A certain improvement or improvements in carding machines.* Patent dated December 4, 1854. (No. 2551.)

Claims.—1. Placing the spools or bobbins from which the sliver is fed to carding engines in a perpendicular position, supported on a point or axis of rotation, thereby obviating the necessity of surface motion to deliver such sliver. 2. The arrangement and adaptation of a stop motion to carding engines to be brought into action as soon as a sliver shall break, or cease to be supplied to the feeding rollers.

COLLET, DANIEL, of Paris, Rue de Courcelles. *Improvements in transmitting power.* Patent dated December 4, 1854. (No. 2552.)

The inventor describes an apparatus consisting of one or more screws to which motion is given by any suitable motive power. On each of the screws is a nut, which is so constructed as to open and release the screw on arriving at the end of its path, so that it may be allowed to return. In connection with the nut is a rack which works into a toothed wheel on the axis to which motion is to be communicated. The toothed wheel is so arranged that in one direction it is fast on the axis but in the other direction it revolves loosely, to allow the nut and rack to return to its starting point.

COOPER, THOMAS, of the Isle of Wight, Hampshire, brickmaker. *Certain improvements in the construction of pipes and in the mode of joining the same.* Patent dated December 5, 1854. (No. 2553.)

Claims.—1. The construction of plain cylindrical pipes with indents or hollows, for the reception of a suitable packing material. 2. A mode of joining pipes together by means of a coupling formed in two parts, and drawn together by inclined planes formed on their edges, or by inclined keys or wedges. 3. The use of couplings made

in two parts with internal ribs or projections which by pressure upon a suitable packing make an air-tight or water-tight joint, and also secure the pipes together.

VARLEY, CROMWELL FLEETWOOD, of Charles-street, Somers-town, St. Pancras, Middlesex. *Improvements in producing and applying dynamic electricity.* Patent dated December 5, 1854. (No. 2555.)

Claims.—1. The use of a positive metal of a conical, sugar-loaf, or similar form placed over the negative metal so that by its form any negative metal deposited thereon shall fall off by the action of gravity. 2. The use of two or more porous divisions with a solution of metal, or both, between them to decompose any negative salt that might otherwise pass to the positive element, &c.

JOHNSON, JOHN HENRY, of Lincoln's-inn-fields, Middlesex, gentleman. *Improvements in the arrangement of electric telegraphs.* (A communication.) Patent dated December 5, 1854. (No. 2556.)

These improvements consist in so arranging the whole of the apparatus necessary for receiving and transmitting intelligence that it may be contained in a box or case which may be carried about with facility. In this box are fitted the battery, the manipulator, the receiver, the alarum, a compass, &c.

WILSON, GEORGE FERGUSSON, managing director, and JOHN CHASE CRADDOCK, superintendent of Price's Patent Candle Company, Belmont, Vauxhall. *Improvements in the manufacture of candles and night-lights.* Patent dated December 5, 1854. (No. 2557.)

This invention has for its object improvements in the manufacture of candles and night-lights when using the stearines of cocoa-nut oil, of the calhoun palm, and of the kernel of the palm-oil nut, which improvements consist in combining one or more of such stearines with a small quantity of hard fat acid, the stearine not being less than three-fifths of the compound.

WARHURST, JOHN, of Hollingworth, Chester, cotton-dealer. *Improvements in furnaces or fireplaces applicable to apparatus for heating water and generating steam.* Patent dated December 6, 1854. (No. 2559.)

The object of this invention is to partially heat the feed-water before it enters the boiler. For this purpose the inventor fixes a hollow metal framework under the boiler, and has pipes connected to it to keep up a circulation of the water within it. He also places pipes or tubes at each side of the fire longitudinally, and attaches them to the fire-bridge and the furnace door-frame, all of which are hollow, so that the water to be heated entering at one side of the door-frame passes along the tubes on one side to and through the hollow fire-bridge, and returns by the other side through the door-frame to the boiler.

FONTAINEMOREAU, PETER ARMAND LECOMTE DE, of South-street, London. *Improvements in coating and colouring metals and alloys of metals.* (A communication.) Patent dated December 6, 1854. (No. 2561.)

This invention relates "to processes for precipitating metal or alloys of metals in cold solutions, without the aid of the battery or poisonous substances, upon metals and alloys of metals."

MARTIN, ALBINUS, of Westminster, civil engineer. *Improvements in the production of indigo dye colours in dyeing and printing textile fabrics and fibrous materials.* (A communication.) Patent dated December 6, 1854. (No. 2564.)

Claim.—Submitting the fabrics or materials to be dyed or printed to baths containing respectively a salt of manganese, orpiment, and caustic alkali, and then to a hot ash or alkaline indigo vat, as described.

HODGSON, CHRISTOPHER, and JAMES WHITLEY STEAD, of Salford, Lancaster, machine-makers. *Improvements in machinery or apparatus for washing or cleansing woven fabrics and clothes, part of which apparatus is also applicable to churning milk and cream.* Patent dated December 7, 1854. (No. 2567.)

The squeezing-machine employed by the inventors consists of rollers which revolve on their axes in a frame or standard through which the fabrics or clothes pass after having been washed. On the top of this frame or standard is fixed a cross shaft which also revolves on its axis, and which is furnished with two cranks, placed at about its centre, but in opposite directions. To each of these cranks is fixed a rod, one being jointed so as to accommodate itself to both a vertical and a horizontal motion, and an ordinary washing tub, with the common peggy or dolly, is placed at the front of the apparatus. Each of the crank levers is attached to one of the projecting arms of the peggy or dolly (or to a block or cross-head fitted upon it) which by means of these levers receives both an up and down and a twisting motion.

PHELPS, JOSEPH, of Croydon, Surrey, ironmonger. *Improvements in apparatus for damping postage and other stamps, labels and like articles.* Patent dated December 7, 1854. (No. 2568.)

A full description of this invention is given on page 588 of our last number.

FAIRRIE, JOHN, of Church-lane, Whitechapel. *Improvements in preparing solutions of sugar for filtration.* Patent dated December 7, 1854. (No. 2570.)

Claim.—"The method of dissolving sugar in suitable proportions of water at a low

temperature, and heating the solution to the point suitable for filtration, by the application of a surface or surfaces heated by steam or otherwise, and this either under the ordinary pressure of the atmosphere, or in a vacuum more or less approaching to perfectness."

McConnell, James Edward, of Wolverton, Bucks, civil engineer. *Improvements in steam-engines.* Patent dated December 7, 1854. (No. 2571.)

Claims.—1. The application and use of blast-pipes divided into alternate water and steam spaces by one or more pipes or tubes enclosed in an outer shell or casing, for the purpose of heating the feed-water of steam boilers before its introduction into the boiler. 2. A peculiar construction and arrangement of pistons for steam engines, fully described at page 130 of our current volume. 3. The application and use of boiler-tubes with reduced capacities at their ends next the smoke-box of locomotive engines for the purpose of bringing the heated gases more effectually in contact with the tubes.

Blumenthal, Ferdinand Collier, of Paris, gentleman, and Maximilian Louis Chollet, also of Paris, manufacturer. *Preserving meats.* Patent dated December 7, 1854. (No. 2572.)

Claims.—1. A mode of double drying in which the raw or cooked meat, seasoning, or condiments, are first dried in small pieces, and again dried when reduced to powder. 2. A mode of grating or reducing meat or seasonings to a powder by means of a rasp, grater, or other suitable apparatus for the purpose of more effectually drying the same. 3. The compression of the dried powdered substances by hydrostatic pressure or other suitable means. 4. The combination of meat powder with vegetable tablets for producing soup tablets.

Browne, John Collis, of Weston-super-Mare, Somerset, physician. *An improved wrapper applicable as a coat and other covering.* Patent dated December 7, 1854. (No. 2573.)

The inventor sews a casing across the breadth of a railway or other wrapper, at about one-fourth of its length from the end, and introduces two cords into this casing, one attached to one side or selvage of the wrapper, and the other attached to the opposite side or selvage, so that by pulling the cords in the opposite directions the wrapper is puckered up round the neck, &c.

Brooman, Richard Archibald, of 166, Fleet-street, London, patent agent. *An apparatus for regulating tension in spinning frames.* (A communication.) Patent dated December 7, 1854. (No. 2574.)

This invention consists of an arrangement of machinery comprising certain revolving shafts carrying crank-arms furnished with grooved pulleys, &c., the object being to regulate the tension on the threads so as to allow self-acting and other mules to work the higher numbers of threads without difficulty.

Heseltine, Samuel, of Harwich, Essex gentleman. *Improvements in the construction of cannon, shot, and shell.* Patent dated December 7, 1854. (No. 2576.)

This invention consists—1. In forming oannon of a cast-metal cylinder surrounded by another of wrought-metal. 2. In forming oval shot or shell with ribs upon them. At the rear end of these shot or shell the inventor applies a loose ring, washer, or filling block, which bears against the rear end of the ribs, and thus permits the full force of the powder employed to be exerted upon the projectile. This ring, washer, or block falls from the shot during its flight, and the shot then presents a reduced diameter to the atmosphere.

Aubury, George, of Queen-street, Edgeware-road, Middlesex, and William Richard Bridges, of Gravel-lane, Surrey. *A portable apparatus for the manufacture and supply of gas.* Patent dated December 8, 1854. (No. 2579.)

This invention consists in using a portable gas-producing retort of such form and construction that it may be conveniently fitted or adjusted to stoves of the kind ordinarily found in kitchens or dwelling apartments, the retort being furnished with a gasometer and pipes in the usual manner, on a scale proportioned to its size, and with suitable contrivances for fixing the apparatus in the required position, and for removing it when desirable.

Jolly, Frederic, of Turton, Lancaster, manager. *Improvements in machinery or apparatus for mangling, stiffening, filling, and finishing cotton and other piece goods.* Patent dated December 8, 1854. (No. 2580.)

These improvements consist in the application to mangles, such as are used by bleachers, of an additional trough or troughs containing starch or any other suitable substance or composition with which it is desired to finish the surface of the cloth operated on, and in combination with such additional trough or troughs, of suitable apparatus and bowls by means of which th cloth is conducted into and through the substance, or between bowls by which the substance is pressed into or upon the cloth.

Hawthorn, William, of Newcastle-upon-Tyne, engineer. *Improvements in safety-valves.* Patent dated December 8, 1854. (No. 2582.)

Claim.—The application and use of a double-face valve with one or more rings,

having the faces on the same plane or otherwise, as a safety-valve for steam generators generally, or for pipes or vessels containing steam, &c.

COMPLETE SPECIFICATIONS FILED WITH APPLICATIONS.

PASQUIER, EUGÈNE, engineer, of Rheims, France. *An improved machine to be used for drying wool and other fibrous materials.* Application dated April 11, 1855. (No. 800.)

This invention consists in "the combined application of dry air which is shut up, and of ventilation causing this air to pass through an endless cloth upon which the wool or other moist material is fed."

HJORTH, SOREN, of Copenhagen. *An improved electro-magnetic battery.* Application dated April 11, 1855. (No. 806.)

In carrying out this invention a series of armatures placed on a wheel revolving slowly are brought in succession between the poles of permanent magnets, and the poles of a series of electro-magnets surrounded with spiral coils of copper wire, and placed within cylinders also coiled with wires.

HJORTH, SOREN, of Copenhagen. *An improved electro-magnetic machine.* Application dated April 11, 1855. (No. 807.)

This invention mainly consists in combining a series of hollow electro-magnets, having their poles in opposite directions, with a series of annular projecting surfaces within, and in metallic connection with such electro-magnets, and arranged so as to act in succession upon a movable compound electro-magnet, and thereby produce a stroke of a length sufficient for practical purposes.

HJORTH, SOREN, of Copenhagen. *An improved electro-magnetic machine.* Application dated April 11, 1855. (No. 808.)

This invention consists in arranging a series of hollow square electro-magnets in a metallic ring, in combination with revolving armatures shaped so that their surfaces receive a direct action from the poles of the electro-magnets in succession.

SCHOOFS, HENRI, of St. Gilles, near Brussels, Belgium. *Improvements in making, fixing, or attaching artificial teeth, gums, and palates.* Application dated April 21, 1855. (No. 893.)

The inventor applies on all the parts near an impaired maxillary roof or palate a layer of gutta percha or caoutchouc, either mixed or separate, or modified by the mixture of other gums, according to the greater or less susceptibility of the organ. This layer lies in a ductile or partially melted state, heat having been previously imparted to it by a metallic mould, on which it is laid. On this layer, and at their respective places, the adjusted teeth are placed, and all the fixings of wire or plates are covered by another layer of a similar material. The second layer amalgamating with the first now forms with the teeth a single solid piece. The last layer, as it advances on to the palate or roof of the jaw, diminishes till it is reduced to nothing, so that the tongue shall not encounter any ridge or unevenness that may be avoided.

ILIFFE, HENRY JEREMIAH, and JAMES NEWMAN, of Birmingham, Warwick, manufacturers. *Improvements in the manufacture of covered buttons.* Application dated April 23, 1855. (No. 909.)

The inventors describe a button composed of two metallic shells, covered with linen or other material, and secured together by means of portions of the shells which are turned up before the coverings are put on, and pressed down after the back shell has been placed in the front.

SYMINGTON, WILLIAM, of Little Bowden, Northampton, coffee-roaster. *An improvement in preparing peas, and pearl and Scotch barley, for culinary purposes.* Application dated April 25, 1855. (No. 920.)

This invention consists in preparing peas and barley by subjecting them to high-pressure steam, producing a powder which is soluble and fit for use in the preparation of soup, or for other culinary purposes, without the process of boiling.

LYONS, MORRIS, of Suffolk-street, Birmingham, Warwick, chemist. *An improved enamel for coating metal and bricks.* Application dated April 27, 1855. (No. 954.)

This invention consists in the employment of the following ingredients in the following proportions for making an enamel: viz., finely powdered glass, six pounds; red lead, five pounds; carbonate of potash, one pound and a half; carbonate of soda, two pounds; boracic acid, two pounds. These are to be mixed well together, fused in a covered crucible, and poured into water.

BROUGH, NEHEMIAH, of Birmingham, Warwick, machinist. *Improvements in slide-buckles.* Application dated May 11, 1855. (No. 1061.)

In carrying out this invention a thin face plate of metal is stamped out to the required form, and has formed upon it small lugs with holes sunk in them to receive pins formed on a second stamped plate of metal which is attached to the brace ends, or to the ends of the girth or belt, as the case may be. Certain pins are then sprung into the holes in the small lugs, and the two parts are thus connected.

CADDICK, DAVID, of the Ebbw Vale Iron-works, Monmouth, mason. *Improvements in puddling furnaces.* Application dated May 11, 1855. (No. 1066.)

This invention differs but little, if at all, from that of the same inventor, described on page 547 of No. 1661.

WARNER, ARTHUR, of New Broad-street, London. *Improvements in combining sheets of copper, or its alloys, with lead, tin, zinc, nickel, gold, silver, platinum, or alloys containing these metals, or some of them, with or without the addition of copper, antimony, bismuth, arsenic, manganese, or mercury.* Application dated May 12, 1855. (No. 1067.)

This invention consists in flushing or coating one surface of a sheet of copper or its alloys with suitable solder, and then causing the coated surface to adhere to a sheet of one or other of the metals mentioned in the title by means of heat applied through the sheet of copper or its alloys, aided by pressure.

GUILD, ADAM, of Manchester, Lancaster, engineer. *Improvements in the process of bowking.* Application dated May 12, 1855. (No. 1068.)

"I have ascertained," says the inventor, "that if materials are subjected to the action of the scouring solution in a closed vessel, at a very high temperature, the bowking or cleansing of the materials will be more speedily and thoroughly effected, and without injury or deterioration to the texture of the fabrics." He accordingly constructs apparatus for giving practical effect to this discovery.

PETERS, RICHARD, of Union-street, Borough, Surrey, engineer. *Improvements in steam engines.* Application dated May 16, 1855. (No. 1106.)

This invention consists in such a combination and arrangement of parts as will produce one revolution of the crank and its shaft for a single stroke of the piston, and this is effected by making the stroke of the piston twice the ordinary length, that is four times the length of the crank, and by suspending the cylinder upon an axis on which it is free to rotate. The crank shaft is so placed that its centre of motion may be eccentric to the axis of the cylinder, and the rod of the piston is connected with the crank pin by means of a bush fixed on the said rod, and working in a groove or grooves or other convenient guides attached to the cylinder, and passing through its axis of motion.

PUTNAM, SILAS SAFFORD, of Massachusetts, United States. *A new or improved forging machine.* Application dated May 24, 1855. (No. 1174.)

This invention mainly consists in so combining four hammers together that two of them may be approaching while the other two are receding from one another, and that the momentum of the receding hammers may be brought into action upon the approaching hammers so as to increase the effect of the blows produced by them.

ROBBINS, SAMUEL EDWIN, of Vermont, United States. *Certain new and useful improvements in fire-arms.* (Partly a communication.) Application dated May 24, 1855. (No. 1175.)

This invention primarily consists in the combination of a stationary with a movable series of barrels and mechanism by which the latter may not only be connected to the former, so as to bring the axes of their bores respectively in range with each other, but be also so practically disconnected when occasion may require, as to enable the charge chambers to be loaded independently.

VON GILGENHEIMB, THEODOR, Baron, of Widenau, Silesia. *A new machine for tilling land.* Application dated May 24, 1855. (No. 1177.)

"I make," says the inventor, "the spades or shovels worked by my machine enter the soil lengthwise, with their cutting edges or sides throw it up and cast it into the next furrow, while a polygonic plate connected with an eccentric wheel of cast-iron gives motion to these shovels. By means of this combination the firmness and power of the spades or shovels is increased, and the friction and breaking of the cogged or toothed wheels cannot occur," &c.

BELLFORD, AUGUSTE EDOUARD LORADOUX, of Essex-street, London. *Certain improvements in ordnance, and in cartridges therefor.* (A communication.) Application dated May 28, 1855. (No. 1214.)

The first part of this invention consists in fitting cannon in embrasures closed all round the piece, so as to shield the gunners, the cannon being necessarily breech-loading in this case. The second part consists in a peculiar mode of constructing, arranging, and operating a movable breech; and the third part relates to the construction of cartridges for breech-loading ordnance. The case of the improved cartridge is to be made of tin-plate or other sheet metal, and the ends of it are to be of hemispherical or other convex form.

PROVISIONAL SPECIFICATIONS NOT PROCEEDED WITH.

LISTER, JOHN, of Ruthven, Perth, dyer. *Improvements in the treatment or preparation of dyeing or colouring materials.* Application dated December 2, 1854. (No. 2545.)

This invention relates to a mode of treating various dyeing and colouring materials, such as Lima-wood, log-wood, and munjeet, for the purpose of rendering the colours produced from them more durable than heretofore, and it consists in soaking the

material in diluted sulphuric or hydrochloric acid, after which it is well washed before being used.

THOMPSON, WILLIAM, professor of natural philosophy in the University and College of Glasgow, WILLIAM JOHN MACQUORN RANKINE, of Saint Vincent-street, Glasgow, civil engineer, and JOHN THOMPSON, of Saint Vincent-street, Glasgow, civil engineer. *Improvements in electrical conductors for telegraphic communication.* Application dated December 4, 1854. (No. 2547.)

This invention consists in providing for each independent electric current in electrical conductors for telegraphic communication a strand, cord, or rope, consisting of several conducting wires in contact with each other, with or without hempen or other cores, instead of a single conducting wire for each independent electric current as formerly practised, such strands, cords, or ropes being coated with gutta percha or other insulating material, and protected, either singly or in compound cords, by iron cables or otherwise, in a manner similar to that now known and practised with respect to single conducting wires for each independent current.

RUSSELL, FRANCIS WILLIAM, of Westbourne-street, Hyde-park-gardens, Middlesex, member of Parliament for Limerick. *Certain improvements in looms.* Application dated December 4, 1854. (No. 2549.)

The primary part of this invention is intended to obviate or compensate for the increased strain which is thrown upon the yarns or threads forming the warp by the headles or harness when the shed is opened or separated for the passage of the shuttle. This object the inventor proposes to effect by causing the rollers or beams which carry either the yarn or the cloth, or both, to approach as much nearer to each other as the yarns are extended by the action of the headles, in order to render the strain upon the yarn uniform.

ALMGILL, THOMAS, of Busby, near Glasgow, Lanark, engraver. *An improved meter for measuring water and other fluids.* Application dated December 5, 1854. (No. 2554.)

The inventor proposes to measure fluids by means of a scale-beam, to the pivot of which is fixed a pall that takes into a ratchet wheel which is turned the space of a tooth by each descent of the scale-beam with the pall, and which is thereby made to indicate the quantity of fluid passed at each change of the cock.

BULLOCK, AUGUSTUS THOMAS JOHN, of Woolwich, Kent, lieutenant in the royal navy. *An improved raft or apparatus for saving life at sea.* Application dated December 6, 1854. (No. 2558.)

This invention consists of a sliding raft fitted to all ships, whether sailing vessels, paddle wheel, or screw steamers, in such manner that it can be readily launched, or that it will float off in the case of the ship foundering. In paddle wheel steamers the inventor makes use of the upper part of the paddle wheel boxes or covers and connects them firmly together by means of two bridges or planks which extend across the ship. He also employs two rails, one to each bridge, extending across the vessel from the outside of one paddle box to the outside of the other, and fits into the bridges friction rollers which run upon the rails, whereby the raft or apparatus can be readily launched into the sea. Should the ship founder then the raft, being buoyant, will float off. For the purpose of rendering the raft more buoyant he applies tubes or air cases to the bridges and covers of the paddle boxes in such manner and at such parts as may be found expedient. In sailing vessels and screw steamers he makes use of the upper parts of the bulwarks, and in men-of-war of the upper part of the hammock nettings instead of the upper part of the covers of the paddle wheel drums.

COSTARD, CONSTANT, and GEORGE PHILIP COLLAS, both of Jersey. *Improvements in projectiles.* Application dated December 6, 1854. (No. 2560.)

This invention consists in making projectiles with pieces of metal projecting from their sides, the projections being acted upon by a spring so as to give them a certain amount of elasticity.

GEDGE, JOHN, of Wellington-street South, Middlesex. *Improvements in closing, stopping, or securing the necks of bottles and other similar vessels.* (A communication.) Application dated December 6, 1854. (No. 2562.)

The inventor says, "I propose to stop or secure bottles and act upon the contents thereof in the manner of a syphon. I take a tube of metal and place in it a pedal which works therein and projects at one side of the neck of the bottle (this tube I call a plunger); I place in it another tube having a screw at each end (male and female); on the upper end I fix a nut and on the lower a capsule, with exterior rim stripped in four or more sections, and covered with India-rubber, into which the plunger tube passes. The screw draws up the capsule, which, being larger at its base, spreads out the sections of the capsules in the empty part of the bottle and thus forms a perfect joint."

MACKIE, JOHN WYSE, of Edinburgh, Midlothian, biscuit-baker to her Majesty. *An improved description of food.* Application dated December 6, 1854. (No. 2563.)

This invention consists in incorporating

the essence of butcher's meat with flour, &c., and in forming therewith a biscuit, which, by the addition of boiling water, may be rendered suitable as a food in another form.

ANDERSON, JAMES, of Dumbarton, North Britain, shipwright. *Improvements in bending and shaping angle and bar iron for ship-building and other purposes.* Application dated December 6, 1854. (No. 2565.)

The inventor employs a platform in which are formed grooves which diverge from a line corresponding to the vertical centre line of the ship, and a series of carrier pieces work in the grooves, being actuated by a longitudinal screw working in a half-nut formed in the bottom of the groove, and turned by means of small bevil wheels and a vertical spindle: or a nut or half-nut is formed in the carrier pieces and these are moved by screw spindles lying along the grooves and actuated at the outer edges of the platform. The carrier pieces carry the blocks for bending and shaping the frames, these blocks being mounted on swivel joints so that their acting faces may be set accurately parallel to the frames at the several points.

DE MORNAY, EDWARD, of Cork-street, Burlington-gardens, Middlesex, civil engineer. *A new construction of guns, and a new form of projectile peculiarly applicable to such guns, but which can be also used for ordinary guns.* Application dated December 6, 1854. (No. 2566.)

The inventor proposes to construct guns of a series of annular parts and a breech-piece bolted together, and the projectile he recommends is a cylinder of solid metal, smaller in circumference than the bore of the gun, flattened or concave at the end next to the charge, and conical or convex at the other end, which should be weighted. Two or more rings of brass or other suitable substance is to be fixed round the circumference of the cylinder, one near each extremity.

EDEN, GEORGE HENRY, of Birmingham. *An instrument for sharpening razors.* Application dated December 7, 1854. (No. 2569.)

The inventor forms an instrument fitted with steel pins, between which the edge of the razor is drawn under pressure.

CARNEY, NATHANIEL B., of New York, United States of America. *A circular power-loom for weaving circular, cylindrical, and irregular-shaped fabrics.* Application dated December 7, 1854. (No. 2575.)

This invention relates to a novel arrangement of mechanism for circular weaving, in which a continuous forward movement through the shed is given to the shuttle or shuttles.

METCALF, THOMAS, of High-street, Camden-town, Middlesex, gentleman. *An improved construction of bath chair.* Application dated December 7, 1854. (No. 2577.)

The chief object of this invention is to construct an invalid chair, suitable for outdoor use, in such manner that it will admit of being folded up and packed away in a comparatively small space for the purpose of transport.

PROVISIONAL PROTECTIONS.

Dated April 27, 1855.

952. Emile Muller, civil engineer, Joseph Gilardoni, and Xavier Gilardoni, of Rue de Provence, Paris. A grooving and clamping hooked tile, by means of which the entire covering of a roof is tied together, a machine for the fabrication of such tile by which it is continuously delivered from the mould through a peculiar system of delivery, applicable to any matter that may be moulded, and a conterminous succession of furnaces for its burning.

Dated May 23, 1855.

1158. Lazare Ochs, of Saint Josse ten Noode, near Brussels, Belgium, lace manufacturer. Improvements in the manufacture of certain kinds of paper from the refuse and cuttings of leather during the operation of tanning. A communication.

Dated May 28, 1855.

1212. Edward George Swinton, of Warsash House, near Tichfield, Hampshire, captain in 3rd Light Dragoons. Improvements in applying motive power for grinding corn, and for other similar purposes.

Dated June 4, 1855.

1269. George Henry Ingall, of Bartholomew-lane, London, gentleman. Improvements in coupling railway carriages.

1271. William Henry Graveley, of Upper East Smithfield, Middlesex, ships' fire hearth-manufacturer. An improved apparatus for cooking purposes, and improvements for the production of fresh water for ship and land use.

1273. Edmund Morewood and George Rogers, of Enfield, Middlesex. Improvements in coating sheets of wrought-iron.

1275. William Edward Newton, of Chancery-lane, Middlesex, civil engineer. An improved construction of ships' auger. A communication.

Dated June 5, 1855.

1277. John Gedge, of Wellington-street South, Middlesex. Improvements in combs, called curry-combs. A communication from Mr. F. V. Vauconsant, of Metz, France.

1279. John Gedge, of Wellington-street South, Middlesex. Improvements in the distribution of motive power. A communication from Emile Grill, of Beziers, France.

1281. Thomas Barrows, of Massachusetts, United States of America. Improvements in the treatment of wool preparatory to its being carded, spun, or woven.

1283. Thomas Barrows, of Massachusetts, United States of America. Improvements in the treatment of wool.

1285. John Tenwick, of Orchard-hill, Lewisham-road, Kent, iron-moulder. Improvements in water-gauges for steam boilers.

1291. Paulin Lolmède, of Saux (Département du Lot), France, physician. A new instrument for the administration of medicinal substances.

1293. Henry Leech, of Preston, Lancaster, ma-

dealer, James Robinson, of the same place, wine-merchant, and Richard Burrows, of the same place, mercer. Certain improvements in machinery or apparatus for spinning cotton and other fibrous substances.

1295. Henry Nunn, of Mabledon-row, Burton-crescent, Middlesex, whitesmith. Improvements in the construction of carriages for invalids and children, part of which improvements is also applicable to street cabs and other carriages.

1297. William Baines, of Coverdale-terrace, Hunter's-lane, near Birmingham. Improvements in certain parts of railways, and for the methods of manufacturing and constructing part of the same.

Dated June 7, 1855.

1299. John Ramsbottom, of Longsight, near Manchester, engineer. Improvements in safety-valves and feeding apparatus for steam-boilers.

1301. Moses Heap, of Blackburn, Lancaster, print-dealer. Certain improvements in machinery or apparatus for grinding dye-woods or roots, and for other similar pulverizing purposes.

1303. André Orange, of Edinburgh, Mid Lothian, artist. Improvements in obtaining representations for commercial purposes of articles for sale.

1305. Diederich Fehrman, of Liverpool, oil-merchant. Improvements in lamps. A communication.

1307. Richard Anstey Tucker, of Lenton, Nottingham, starch manufacturer. Using the gas and smoke arising from coal or other substances during the process of combustion for fuel.

Dated June 8, 1855.

1309. Robert Caunce, of Bolton-le-Moors, Lancaster, cashier. Improvements in machinery for sizeing, dressing, and warping yarn.

1310. Peter Armand Lecomte de Fontainemoreau, of South-street, London. Certain improvements in the manufacture of iron shovels. A communication.

1311. Frederick Weaver, of Clarence-place, Handsworth, Stafford, bone-dealer and grinder. Improvements in machinery for grinding or crushing bones and other substances.

1312. Isaie Lippmann, of Rue Geoffroy, Saint Hilaire, Paris, France, tanner. Improvements in the treatment of hides and skins for the manufacture of leather.

1313. George Frederick Chantrell, of Liverpool, Lancaster, furnace-engineer. Improvements in apparatus applicable to the manufacture and revivification of animal or vegetable charcoal.

Dated June 9, 1855.

1314. Henri Sibille, merchant, of Paris, France. Improvements in the decortication and preserving of grain and seeds.

1315. John Sutton Nettlefold, Edward John Nettlefold, and Joseph Henry Nettlefold, of Holborn, Middlesex. Improvements in locks. A communication.

1316. Etienne Jules Lafond, engineer, and Count Louis Alfred de Chatauvillard, of Belleville, near Paris, France. Improvements in apparatus for lighting.

1317. Henry Teague, of Lincoln, engineer. Improvements in high and low pressure meters for water, gas, or any other fluid.

1319. Thomas Bright, iron-founder, of Carmarthen, South Wales. Improvements in apparatus for the prevention of waste in water or other fluid supplies.

1320. Masta Joscelin Cooke, of Newcastle-upon-Tyne, gentleman. Preserving provisions and vegetables suitable for armies in the field, for vessels on long voyages, and other purposes, and also for the necessary apparatus for preserving and preparing the same for food.

1321. Joseph Robinson, of Poplar, Middlesex, surveyor. Improvements in tables.

1322. John Greenwood, of Irwell Springs, Bacup, Lancaster, Turkey red dyer. Improvements in purifying oils.

1323. Samuel Colt, of Pall-mall, Westminster, gentleman. An improvement in the construction of fire-arms.

1324. Samuel Colt, of Pall-mall, Westminster, gentleman, and William Thomas Eley, of Broad-street, Golden-square, Middlesex, percussion-cap manufacturer. Improvements in the manufacture of cartridges.

Dated June 11, 1855.

1325. William Kemble Hall, of Mark-lane, London, engineer. Improvements in breaks for railway-carriages.

1326. Henry Bernoulli Barlow, of Manchester. Improvements in certain parts of machines, and in slubbing and roving cotton and other fibrous materials. A communication.

1327. Frederick Collier Bakewell, of Haverstock-terrace, Hampstead, Middlesex. Improvements in bench-planes. A communication from William S. Hopper, of the United States of America.

1328. John David Kind, of Birmingham, Warwick, manufacturer. An improvement or improvements in spindles for locks and latches, and in attaching knobs or handles to the said spindles.

1329. Joseph Louis Casartelli, of Manchester, Lancaster, optician. Improvements in pressure and vacuum gauges.

1330. Edward Vincent Gardner, of Norfolk-street, Middlesex Hospital, Middlesex, and John Hutchinson Walker, of Cole-street, Dover-road, Surrey. Improvements in separating cotton, flax, hemp, jute, and other vegetable substances from manufactured fabrics containing wool, and in preparing the wool for remanufacture.

1331. William Barrington, of South-villa, Limerick, and William Richard Le Fanu, of Fitzwilliam-square, Dublin, civil engineers. An improved mode of joining "bridge-rails," in the permanent way of railways by means of a fish-piece.

1332. Frederick Thomas Stoneham Bardo, of the Royal Exchange, London, manager to Carter and Bromley, stationers. An improvement in cases for carrying tickets, cards, and other like articles.

1333. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in metallic pens. A communication from Samuel Barbot, of Paris, mechanician, and Louis Charles Riottot, of l'Isle Adam, France, jeweller.

1334. John Henry Johnson, of Lincoln's-inn-fields, Middlesex, gentleman. Improvements in governors or regulators for prime movers. A communication from François Theophile Moison, of Mouy, France, mechanician.

1335. Isaie Lippmann, of Rue Geoffroy, Saint Hilaire, Paris, France, tanner. Improvements in dyeing or colouring the hides and skins of animals.

Dated June 12, 1855.

1336. John Joseph Liebisch, of London, engineer. Improvements in rails for railways.

1337. William Armytage, of Manchester, Lancaster, spinner and manufacturer. Improvements in the manufacture of union-bags and sail-cloth.

1338. Nathan Hackney, of North-street, Hull. An improvement in the manufacture of earthenware, china, and porcelain.

1339. Samuel Coulson, of Sheffield, metallurgist. An improvement in the preparation of sulphate of baryta, and in the manufacture of glass when sulphate of baryta is used.

1340. William Beckett Johnson, manager for Messrs. R. Ormerod and Son, of Manchester, Lancaster, engineers. Improvements in steam-boilers and safety-valves.

1341. Thomas Metcalfe, of High-street, Camden-town, Middlesex, gentleman. An improved mode of manufacturing collapsible hats and bonnets.

1342. Charles Parker, of Dundee, Forfar, manufacturer. Improvements in weaving.

1343. Henry William Ford, of Gloucester, civil

engineer. Improvements in machinery or apparatus for effecting agricultural operations.

1345. John Charles Brant, manufacturer, of Surrey-square, Old Kent road, Surrey. Improvements in laying rails, chairs, and sleepers, for the permanent way of railways.

NOTICES OF INTENTION TO PROCEED.

(From the "London Gazette," June 26th, 1855.)

350. William Carter Stafford Percy and William Craven. Improvements in the manufacture, and in machinery and apparatus used in the manufacture, of bricks, tiles, pipes, and other articles made from plastic materials.

364. George Redfield Chittenden. Improved apparatus for measuring fluids. A communication.

372. Samuel Kershaw and James Taylor. Certain improvements in carding engines.

375. Jean Wothly. Improvements in the preservation of meat.

387. William Maynes. Certain improvements in self-acting temples to be used in weaving.

411. John Haines White. An improvement in the method of applying artificial teeth.

418. Auguste Edouard Loradoux Bellford. Certain improvements in the manufacture of soda. A communication.

463. John Henry Johnson. Improvements in slide-valves for steam-engines. A communication from Erasmus D. Leavitt, of Lowell, United States of America.

555. James Murdoch Napier. Improvements in the furnaces used in the manufacture of soda or alkali.

568. Robert Neale. Improvements in copper and other plate-printing.

601. John Henry Johnson. Improvements in steam engines. A communication from Narcisse Duvoir, of Liancourt, France, mechanical engineer.

642. John Henry Johnson. Improvements in hydraulic motive-power engines. A communication from Narcisse Duvoir, of Liancourt, France, mechanical engineer.

725. Thomas Russell Crampton. Improvements in locomotive and other steam boiler furnaces. A communication.

726. Elizabeth Abbott and Matilda Abbott. Improvements in stays.

742. Hiram Powers. Forming perforations or throats to the cutting edges of files or rasps, for allowing the particles cut away to pass through, and to prevent the instrument from clogging or choking.

781. David Cope. Improvements in the manufacture of metallic spoons, forks, and ladles.

819. Thomas Wimpenny and Jonas Wimpenny. Certain improvements in machinery or apparatus for drawing and spinning wool or wool mixed with other fibrous substances.

1007. Samuel Roberts. Improvements in steam-engines.

1135. Edward Holmes Bennett. Improvements in roasting-jacks.

1173. George Walker Muir and Matthew Gray. Improvements in admitting and regulating the admission of air to furnaces.

1189. Auguste Paillard Jaccard. An improved independent centre seconds movement for watches. A communication.

1210. Samuel Rowlands. A new or improved instrument or apparatus to be used for purifying or otherwise treating gas. A communication.

1225. Etienne Jules Lafond and Count Louis Alfred de Chatauvillard. Improvements in the processes of, and apparatus for, treating mineral, animal, and vegetable matters, for obtaining oils, essences, paraffine, and other similar products.

1229. Thomas Vincent Lee. Improvements in generating steam in marine and other boilers.

1248. Robert Ashworth and Samuel Stott. Certain appendages to and improvements in machinery for preparing, spinning, doubling, twisting, and winding fibrous substances.

1249. Thomas Worsdell. Improvements in lifting jacks.

1273. Edward Morewood and George Rogers. Improvements in coating sheets of wrought iron.

1300. John Buncle. An improvement in bleaching resinous substances (calophane) for the manufacture of soap.

1304. John Andrus Reynolds. Improved machinery for discharging volleys of shot.

1307. Richard Anstey Tucker. Using the gas and smoke arising from coal or other substances during the process of combustion, for fuel.

1310. Peter Armand Lecomte de Fontainemoreau. Certain improvements in the manufacture of iron shovels. A communication.

1315. John Sutton Nettlefold, Edward John Nettlefold, and Joseph Henry Nettlefold. Improvements in locks. A communication.

1316. Etienne Jules Lafond and Count Louis Alfred de Chatauvillard. Improvements in apparatus for lighting.

1322. John Greenwood. Improvements in purifying oils.

1326. Henry Bernoulli Barlow. Improvements in certain parts of machines, used in slubbing and roving cotton and other fibrous materials. A communication.

1342. Charles Parker. Improvements in weaving.

Opposition can be entered to the granting of a Patent to any of the parties in the above List, who have given notice of their intention to proceed, within twenty-one days from the date of the *Gazette* in which the notice appears, by leaving at the Commissioners'-office particulars in writing of the objection to the application.

WEEKLY LIST OF PATENTS.

Sealed June 22, 1855.

2705. Frederic Prince.
2706. Edward Loysel.
2722. Benjamin Bishop & Joseph Dyer.
2752. James Pillans.
2758. Francis Preston.
2760. Robert Sam North.
2764. Samuel Smith Shipley.

1855.

6. Bashley Britten.
17. Samuel Aspinwall Goddard.
20. Charles Hustwick and William Bean.
31. Robert Ashworth & Samuel Stott.
40. George Hallen Cottam and Henry Richard Cottam.
42. William Grindley Craig.
58. Ebenezer Bow.
84. Ezra Miles.
87. Francis Preston.
88. William Barningham.
135. William Johnson.
316. George Hallen Cottam and Henry Richard Cottam.
343. Benjamin Gower.
464. William Hodges.
569. John Kidder.

LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

Date of Registration.	No. in the Register.	Proprietors' Names.	Addresses.	Subject of Design.
May 25	3722	J. Wright	Chipping Ongar	Tap Protector.
29	3723	Smith, Lissons, and Co.	Duke-street, Adelphi	Heater and part of a Kettle.
31	3724	R. Brotherhood	Chippenham	Capstan.
June 1	3725	C. T. Bright	Liverpool	Parallel Compass.
6	3726	J. Cuxson and C. F. Lucas	Shiffnall	Fire Escape.
9	3727	E. Cobbett	Villiers street	Cooking Apparatus.
13	3728	Peel, Williams, and Peel	Manchester	Compound Valve.
„	3729	J. Hill	Piccadilly	Army Tent.
19	3730	C. Burton	Regent-street	Parasol.
22	3731	W. Mountcastle	Manchester	Hat.
„	3732	Capt. J. Olive	Liverpool	Valve Plug for Boats.
26	3733	J. M. Fisher	Taunton	Chimney Top.
		PROVISIONAL REGISTRATIONS.		
May 29	668	J. Edwards	Birmingham	Anti-spirt for Pens.
30	669	A. Kuisella	Kilkenny	Flying Machine.
31	670	B. J. Webber	Newton Abbott	Straw Shaker.
June 12	671	Littlehales and Green	Birmingham	Tray Edges.
18	672	W. Eades and Son	Ditto	Screw Wrench.
20	673	C. Desden	New-road	Shirt Front.
23	674	F. Wilkins	Harley-street	Air Cushion.

NOTICE TO SUBSCRIBERS.

The Proprietors of the *Mechanics' Magazine* finding it necessary, in order to meet the wishes of their friends and subscribers, to resume the publication of Advertisements on the wrappers of the weekly numbers of their Journal, call attention to the following scale of charges, which, though exceedingly low, is found to be sufficiently remunerative.

	1 Insertion. £ s. d.	6 Ins. £ s. d.	13 Ins. £ s. d.
4 lines, or 50 words	0 2 0	0 10 0	1 0 0
8 „ 100 „	0 2 6	0 12 6	1 5 0
16 „ 200 „	0 5 0	1 5 0	2 10 0
½ a page, or 400 „	0 7 6	2 0 0	4 0 0
1 „ 800 „	0 15 0	4 0 0	8 0 0

CONTENTS OF THIS NUMBER.

END OF VOLUME SIXTY-TWO.

LONDON: Edited, Printed, and Published by Richard Archibald Brooman, of No. 166, Fleet-street, in the City of London.—Sold by A. and W. Galignani, Rue Vivienne, Paris; Hodges and Smith, Dublin; W. C. Campbell and Co., Hamburg.